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ABSTRACT

The book tries to put the Air Force in the correct perspective according to its role and the necessity for national defense. The three areas covered are strategic offence, strategic defense, and general purpose. The first chapter describes the national policies and objectives and emphasizes the role of the Air Force in peace and war. The second chapter describes the organization of the strategic offense program. The third chapter deals with the need for combat tasks of defense. The fourth chapter is entitled "Tactical Air Forces" and describes the general purpose operations of the Air Force. The last two chapters emphasize the relationship of three defense forces and organizations necessary for further development in research, education, and training programs. The book is to be used only for the Air Force ROTC program. (PS)

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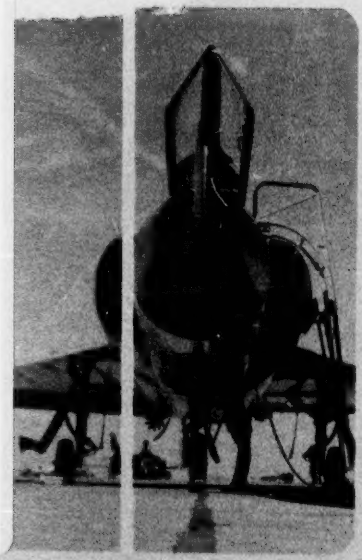

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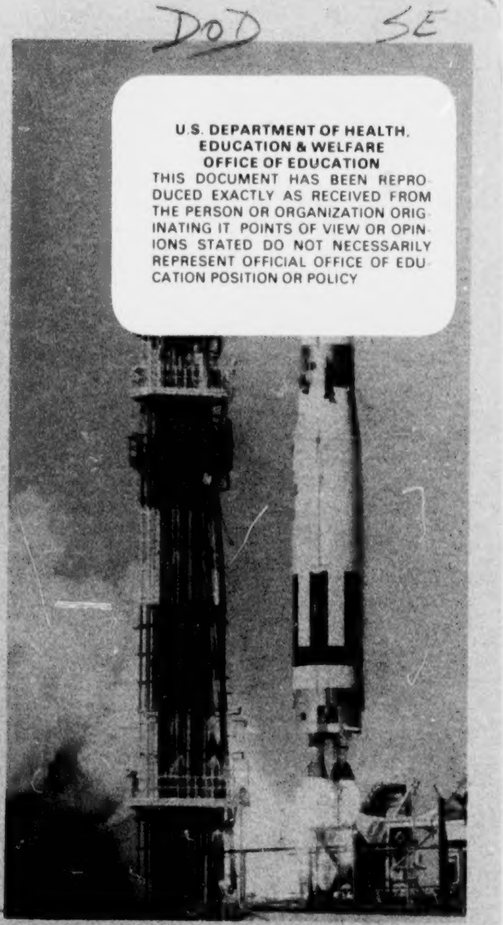

Aerospace Education

II

Military Aerospace

Air Force Junior ROTC
Air University/Maxwell Air Force Base, Alabama

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AEROSPACE EDUCATION II

Military Aerospace

D. S. Savler
Academic Publications Division
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AIR FORCE JUNIOR ROTC
AIR UNIVERSITY
MAXWELL AIR FORCE BASE, ALABAMA

1969

This publication has been reviewed and approved by competent personnel of the preparing command in accordance with current directives on doctrine, policy, essentiality, propriety, and quality.

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This book will not be offered for sale. It is for use only in the Air Force ROTC program.

Preface

THIS TEXT provides an overview of the U.S. Air Force in all its variety of combat and support organizations and activities. It is our purpose to present a dynamic view of this military service—not merely a description of a series of major commands and separate operating agencies, with their missions and organizations, but also some insight into their employment, ways of operation, and weapons and equipment.

The title of this text is not "United States Air Force" but "Military Aerospace." The main focus is on the USAF role in aerospace. However, contributions of the U.S. Army and U.S. Navy to military aerospace are also covered. Our main reason for using this title is to help the student see the Air Force in its proper context, as part of the total national defense effort. The first chapter describes some of the national objectives and policies which the Air Force serves in both peace and war. Other chapters continually refer to interservice command structures, unified commands, which bring together Air Force elements with those of other services to provide the kind of teamwork modern military forces need for effective operation. The Department of Defense views the Nation's total military force structure as having three main combat tasks—strategic offense, strategic defense, and general purpose—and makes up its budget according to these and other categories, not according to branches of the service. Hence this text is organized around this concept, with separate chapters on each of these missions as they apply to the Air Force, plus a chapter which describes the many and varied Air Force support activities that back up the combat forces.

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Chapter 1

Aerospace Forces in Peace and War

THIS CHAPTER describes the nature of national objectives and policies of the United States and states the function of the Armed Forces as instruments for pursuing these objectives and policies both in peacetime and in varying degrees of conflict. It outlines the three basic Armed Forces missions of strategic offense, strategic defense, and maintaining the capability of waging warfare at lower levels. When you have studied this chapter, you should be able to do the following: (1) identify the United States objectives and policies in the field of foreign relations and tell what instruments are used to achieve them; (2) discuss the basic principles governing the use of the military instrument; and (3) explain the organization and functions of the unified and specified commands in relation to their missions.

IN THIS BOOKLET we are dealing primarily with one element of the military instrument of national power—military aerospace power. Later in this course we shall explore the whole military instrument in more depth, but here, in reading about the United States Air Force and the Army and Navy air elements, we should remember three things: that aerospace power is but one element of the military instrument, that this military instrument is but one of several instruments of national power, and that the military instrument itself can be applied in other ways than the outright use of force or the achievement of victory in war. The military instrument is used in combinations with other instruments of power; it is used to gain national objectives and to support national policies. Above all, we should understand that our military forces are instruments of a free society and a democratic government, commanded by the President and answerable to Congress and to the millions of voters who put the President and congressmen in office.

NATIONAL POLICIES AND OBJECTIVES

What are the national policies and objectives we have mentioned?

A national *policy* may be defined as a broad course of action or statements of guidance adopted by the Government in pursuit of national *objectives.* Objectives, in short, determine policy. We are not concerned here with domestic objectives and policies, important as they are, but with those in the field of foreign relations, upon which our aerospace and other military instruments have more bearing.

To begin with, we can identify at least three very fundamental national objectives that have stood the test of time.

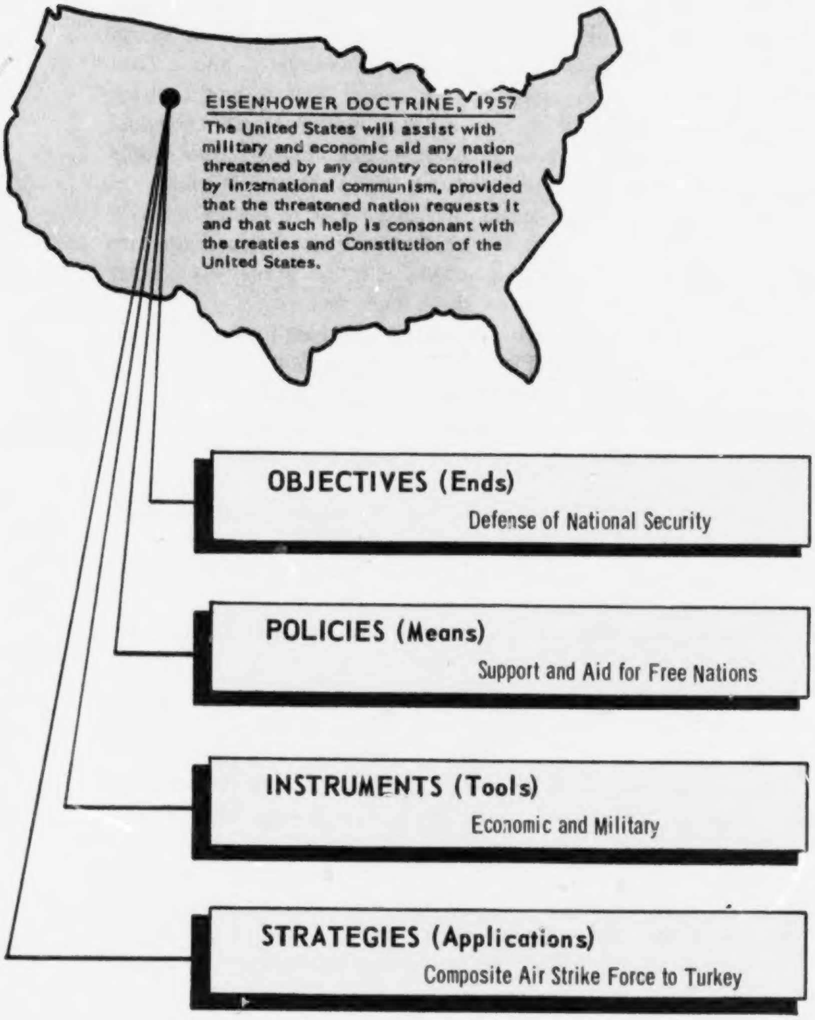
1. Maintain the Nation's territorial integrity and free access to international waters (and, in modern times, aerospace).
2. Preserve the Nation's constitutional form of Government and system of political liberties.
3. Foster national well-being in an environment of international friendship.

Our basic *policy* for accomplishing these aims, however, has changed with the times. Formerly it was believed that the Nation's security could best be protected by strict avoidance of involvement in foreign affairs, or "entangling alliances," as George Washington expressed it. This policy affected the very size and composition of our armed forces, which were designed only to protect our own borders, frontiers, and shores. Even when major conflicts arose and made necessary immense expansion of the armed services, we had time to build these up from the base of a small standing Army and Navy. We did this as recently as World War II. In the twentieth century, however, the United States has grown to world power status and has acquired the problems that go with it. We have been involved in two world wars and have seen the rise of world power systems, such as Nazism and Communism, that have menaced our security. The development of nuclear aerospace weapons has destroyed the security formerly afforded us by two oceans, and deprived us of the time to mobilize after hostilities begin. A small nation close to our shores has undergone a political revolution that has turned it into a dangerous instrument of a major hostile power half a world away. This is but one example of how military, political, and economic problems are intermixed on a global scale and subject to no simple solution. For these and other reasons, the former U.S. policy of non-involvement or "isolationism" has given way to one of involvement in international affairs or "internationalism." Again, the size and composition of our armed forces, and the strategy for their employment, have changed because of these factors.

Having mentioned three fundamental and long-term objectives, we can add several more objectives that apply more specifically to the security needs of our Nation today—in the type of world that has emerged since 1945.

1. Prevent expansion of Communist power and influence.
2. Deter war.
3. Maintain a military posture which will insure victory in either a general or limited war.
4. Strengthen the economic and military power of the free world relative to that of Communist nations.
5. Increase the will and determination of free peoples to resist Communist aggression and subversion.
6. Create conditions under which the attractive power of free institutions and open societies will be greater than that of totalitarian systems.

Taken as a whole, these objectives frankly are those of promoting the welfare and security of *our* Nation and its people. But they are also based on the fact that our welfare and security are promoted by improving the welfare and security of all the peoples in this world who want to live in peace. It is obvious also that the Nation's military instrument alone cannot meet such a list of objectives. Other instruments of national power besides the military instrument are used. These are sometimes defined as political, economic, and psychosocial—more often used in combination than one at a time. Government departments and agencies, such as the Department of State, the Department of Commerce, the Agency for International Development, and the United States Information Agency, employ



EISENHOWER DOCTRINE, 1957

The United States will assist with military and economic aid any nation threatened by any country controlled by international communism, provided that the threatened nation requests it and that such help is consonant with the treaties and Constitution of the United States.

OBJECTIVES (Ends)
Defense of National Security
POLICIES (Means)
Support and Aid for Free Nations
INSTRUMENTS (Tools)
Economic and Military
STRATEGIES (Applications)
Composite Air Strike Force to Turkey

Figure 1. International relations in action.

these instruments, and nongovernment organizations and individuals also play an important part in promoting national policy. It may be necessary at times to use these instruments to threaten, deter or discourage actual or potential aggressors. It is more frequently necessary to use them to reassure allies that we will not let them down in time of peril or need, or to offer neutral or uncommitted nations or peoples help in building a better future, or at least to reassure some of these peoples that we are no menace to their security or barrier to their legitimate desires and ambitions. What may not be so obvious is the fact that the military instrument itself is sometimes employed in various ways to promote ends like these and is not merely an instrument of force or the threat of force (Fig. 1).

It is the military aerospace instrument as a potential instrument of force that is described at length in this text, but before we get down to describing forces and weapons and their ways of operating in different kinds of warfare, let us mention some of the ways in which U.S. aerospace and other military forces have been used in noncombat roles.

PEACETIME AND "COLD WAR" USES OF MILITARY POWER

The military instrument of national power has many uses in time of peace. Other uses arise in times of not-quite-peace—not-quite-war, such as have existed almost continuously since the end of World War II, and have been commonly called "the cold war." In such a situation, the military does not remain asleep or idle and wait for the outbreak of a real war. It spends much of its time studying, training, conducting maneuvers, developing new weapons and tactics, and otherwise preparing for its major wartime role; but it also continues to serve as an instrument. It is used for such purposes as deterring aggression, participating in small actions less than declared war, influencing nations, gaining the friendship of other nations, gaining support for national policies, and performing humanitarian acts.

Shows of Force

Displays of combat might and combat potential to help establish a nation's position and power are common among nations. In 1908, President Theodore Roosevelt sent the entire U.S. battleship fleet, popularly called the "Great White Fleet," on a world cruise to quell any doubts as to the strength of the United States.

In 1950, when the Nationalist versus Communist Chinese situation became tense, President Harry S. Truman sent the Seventh Fleet to the Formosa Strait. This action not only had a deterrent effect upon the Chinese Communists but also indicated to the rest of the world that the United States was willing and, more importantly, able to stand behind its allies.

Rapid Deployments

The rapidity with which aerospace forces can move from one area or one task to another, makes them especially effective national policy instruments. This is clearly demonstrated by the practice of the United States of sending Strategic Air Command aircraft to overseas bases on a regular schedule. It was even more clearly demonstrated in 1958 when the Tactical Air Command of the Air Force, along with elements of other services, sent a special force to the Middle East to strengthen a faltering government in a time of crisis.

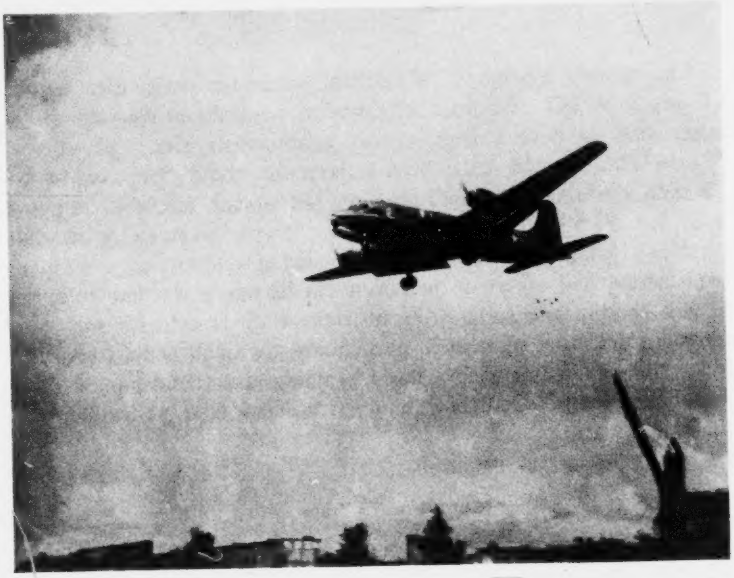


Figure 2. Pilot of this C–54 on Berlin Airlift dropped candy and gum on the city by means of small parachutes.

The Berlin Airlift

One of the most notable uses of the Air Force element of the military instrument was the Berlin Airlift that broke the Berlin Blockade of 1948–49 (Fig. 2). In an effort to halt the creation of a West German state, the Soviet Union imposed a tight blockade upon the western sector of Berlin. The United States replied by supplying food and other essentials for the 2,500,000 inhabitants in the beleaguered zones by means of an airlift never before equaled. For almost 15 months, cargo aircraft, at first C–47's, later on four-engined C–54's for the most part, flew in an endless stream from bases in West Germany to the western sectors of Berlin. During that period, Allied planes flew 2,343,000 tons of supplies into Berlin. United States aircraft carried 76 percent of this total. The Air Force's quick reaction to this emergency and its ability to penetrate to the very heart of the problem enabled the free world to break the blockade. The action made a substantial contribution to the accomplishments of the free world, and the United States objective of establishing a free and independent West Germany and West Berlin.

Capability Demonstrations

The Air Force can demonstrate its capabilities at times without doing so in a provocative manner. Demonstrations can display not only new weapons but newly developed techniques, or equipment and maneuvers. Establishing records—in speed, distance, altitude, carrying capacity, space exploration, and so on—can favorably affect a nation's prestige and leadership in world affairs.

Humanitarian Activities

Aerospace and other military forces can also further national prestige and gain the friendship and admiration of other nations through humanitarian activities. "Special Warfare" forces of the Army, "Special Operations" forces of the Air Force, and personnel of all services, are trained in techniques of military civic action, to render many kinds of constructive aid to civil populations among whom they are stationed. Such activities range from construction of village schoolhouses and sanitation facilities to direct help in harvesting crops. Medical aid deserves special mention. Whenever possible, U.S. military medical personnel render aid to civil populations—dispensing medicines and shots against contagious diseases, for example, and treating the sick and injured. Military helicopters and other aircraft are employed to fight forest fires and render assistance in rescuing victims of floods, earthquakes and other natural disasters.

Often U.S. military airlift capability is called upon to solve an unusual transportation problem. In 1952 a large group of Moslems making a pilgrimage to Mecca was stranded in Beirut, Lebanon, because of lack of transportation. In "Operation Magic Carpet," the Air Force sent 13 C–54 aircraft from Germany to Beirut to fly 3,763 Moslems to within a few miles of the Holy City. In 1956, the Air Force shuttled 14,000 Hungarian refugees across the Atlantic to the United States. The main history of humanitarian airlift, however, has been written year by year down to the present in numerous smaller missions of mercy. In natural disasters, plagues and "cold war" episodes, the Military Airlift Command of the Air Force, and other U.S. military air elements have come to the rescue of harassed humanity. From Chile to Japan, from Holland to Tanzania, everything from iron lungs to insecticides, from food to medical supplies, has been transported to distressed areas, and refugees have been flown out.

THE INSTRUMENT OF FORCE

It must be recognized, however, that the military instrument has as its primary mission deterrence of war and maintenance of the ability to wage war successfully should deterrence fail. Before going into specifics in the following chapters, let us here consider two general matters: (1) the principles that govern the military posture of deterrence and war-making capability; (2) the main types of warfare for which military forces of a modern major power must be prepared; together with the type of force organization for waging such warfare.

Principles of Military Posture

Basic Department of Defense policy recognizes three basic principles governing our military posture: (1) deterrence of aggression, (2) flexibility, and (3) control.

DETERRENCE.—Deterrence is the prevention of action by inducing fear of consequences. Our Nation must be so strong that any possible aggressor knows that an attack by him will be defeated. We must not only have this strength, but a potential enemy must have positive knowledge of this fact, and of our determination to use this strength.

FLEXIBILITY.—The United States cannot hope to maintain deterrence through massive nuclear power alone. In fact, without other options, the opposite effect may be achieved. A potential aggressor may be emboldened to make small or piecemeal attacks to gain his ends at widely scattered points in the world, sponsor revolutions and civil disorders, encourage one small nation to attack another, and so forth, feeling quite sure that if our only possible response to such moves is to unleash a major nuclear holocaust, our Nation would decline to do so. Therefore we must maintain and keep in a constant state of readiness all kinds of military forces, which can respond to any size situation or war with just the right amount of strength.

POSITIVE CONTROL.—The United States must maintain effective and secure command and control over all its forces and weapons. This command and control system must also be able to survive enemy attack. For example, a special airplane keeps a Strategic Air Command post airborne at all times. On board is a general officer who is ready to assume command if other command posts of the SAC command-and-control system are knocked out. Similarly there are other airborne, seaborne and underground command posts for the President and other top civilian authorities as well as key military leaders, all tied together by protected communications. This complicated but necessary system also reduces the likelihood that an unauthorized or accidental attack would develop into a full-scale war.

Main Warfare and Force Types

The realities of the modern aerospace nuclear age call for a new look at the nature of warfare and the types of military forces required to wage it. The traditional branches of the service, the Army, the Navy, and the Marine Corps, are not just a matter of different uniforms and customs but of age-old practical differences between waging war on land and sea and the different forces and weapons needed for each. When military aviation first developed, it was divided into Army and Navy elements to support land and sea operations. A separate Air Force was created in 1947 because, among other reasons, aerospace was a new medium of strategic warfare and a substantial part of the Nation's airpower could be employed more effectively under independent command and following its own strategic concepts.

But quite a bit of history has taken place since 1947. The realities of today's missile era are again different, and so are the concepts that govern the way U.S. military forces are organized. We still have the Army, Navy, Marine Corps, and Air Force; but it is no longer realistic to send these forces into action as separate land, sea, amphibious, and air warfare forces. Instead, the services team together under major unified commands and smaller task forces, not only in combat but in training. Military forces are described in the new Department of Defense terminology as (1) strategic offensive forces, (2) strategic defensive forces, and (3) general purpose forces (Fig. 3).

This new terminology does not mean a restructuring of command. It is mainly budget terminology. When the Department of Defense asks Congress for money, instead of asking for so much for the Army, so much for the Navy, and so much for the Air Force, it now asks for so much for strategic offensive forces, so much for strategic defensive forces, so much for general purpose forces, and so much for a number of support and other military budget categories, according to current needs. Then the Department

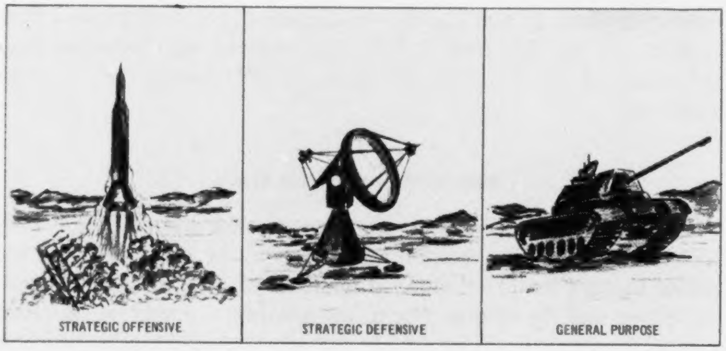


Figure 3. Three type of forces

of Defense allocates money to the different armed services in the same way. The Air Force, for example, contributes resources to strategic offensive, strategic defensive, and general purpose forces, and draws money from these three funds to build these resources. This text is not concerned with money matters, but with the way military forces are organized and employed. Nevertheless, the budget structure provides a realistic way of looking at the resources and operations of our military aerospace forces.

STRATEGIC OFFENSIVE FORCES.—A strategic offense means a full-scale attack on a major power. It is aimed at an enemy's very ability to wage war—his industries, transportation and communications networks, population centers, and main military installations—especially his air and missile bases since these give him his main ability to mount a strategic attack on us. In today's world it is very unlikely that an offensive aimed at the vitals of a major power located thousands of miles away would be conducted by means of a huge invasion. A strategic offense nowadays means in all likelihood an attack through the aerospace medium with nuclear-armed missiles and/or manned bombers. To maintain dererrence, the United States must maintain this destructive capability.

Forces devoted to this purpose include the Air Force's Strategic Air Command (SAC), and the Navy's force of submarines armed with Polaris missiles, called its Fleet Ballistic Missile (FBM) forces. SAC is designated as a *specified* command, meaning that, while it is all of one service, it is under the direct command of the Joint Chiefs of Staff and the President. The FBM forces do not have such a central command structure but they are also directly responsive to top-level command.

These are the forces that possess the highest-yield, longest-range nuclear weapons in the whole U.S. arsenal. To the extent that other U.S. forces have nuclear weapons and can bring themselves into position to strike at strategic objectives, these too are considered part of the Nation's strategic offensive power, but the main responsibility for maintaining such power lies with SAC and the Navy's FBM forces.

STRATEGIC DEFENSIVE FORCES.—Strategic defense means defense against strategic offense as described above. It means defense against aerospace attack. There are two things it does *not* mean. It does not include the aerospace defense of any U.S. or allied military forces or installations overseas, but is limited to the aerospace defenses of the North American Continent—protecting vital U.S. and Canadian industrial, military, and population centers. It also does not include any concept of preemptive attack to destroy enemy aircraft or missiles on the ground, but is reserved for defending against such an attack after it is airborne, taking into account the enemy's potential for surprise and attempting to cope with it by means of the ultimate in electronic and weapon wizardry. It includes mammoth radar installations designed to give North America a scant fifteen-minute warning that enemy ballistic missiles are on the way; it includes a network of communications and control-and-warning nerve centers, coupled with surface-to-air missiles and interceptor aircraft, to deal with the manned bomber threat; and it includes the development of other defenses designed to deal with a variety of aerospace threats from both missiles and satellites.

Air Force elements devoted to the strategic defense mission are under the Air Force's Aerospace Defense Command (ADC). These forces comprise the greater part of the Nation's strategic defensive resources, but the total of these includes elements from all U.S. services as well as Canadian Air Forces elements. The Army's surface-to-air missiles are an important part of the defense against the manned bomber, and the Navy contributes part of the anti-satellite warning system and can be called upon in an emergency to augment the interceptor force. All the U.S. strategic defense forces are united under the Continental Air Defense Command (CONAD), a *unified* command, but CONAD is part of a still larger command which includes the Canadian elements: the North American Air Defense Command (NORAD). Because it is bi-national, NORAD is called a *combined* command.

GENERAL PURPOSE FORCES.—As noted above, to maintain flexibility, the Nation must have military forces capable of waging warfare at all levels as well as meeting various national objectives short of war. In the currently accepted terminology, a great war between two major powers, implying the possibility of strategic offense and defense is called "general war." Various degrees of conflict below that level, in which land and sea forces might be employed in their traditional roles of gaining and holding control of land areas and the seas and meeting and defeating enemy forces in combat, are called "limited war." The latter term, as is obvious, covers a wide spectrum. Combat forces not specifically dedicated to the strategic offensive or strategic defensive missions are also called by a very broad term, "general purpose forces."

It may be a debatable question whether or not any use of nuclear weapons would automatically escalate a limited war to a general war, but general purpose forces of the Army, Navy, and Air Force can be nuclear armed. Nuclear weapons of these forces, however, are generally of shorter range and are less destructive than those employed by strategic offensive forces. They are designed for use against enemy forces rather than strategic targets and are thus called "tactical" nuclear weapons. It is present national policy, however, to put *all* nuclear weapons, including the smallest of tactical nuclear weapons, directly under top-level command, requiring Presidential permission for their use—one more application of the principle of positive control as described above.

General purpose forces include tactical air forces and main combat forces of the Army, Navy and Marines. They range from land, sea, and aerospace forces of tremendous firepower down to forces especially tailored for "Special Operations" and trained in the techniques of psychological warfare, military civic action, guerrilla, and counterinsurgency combat. Air Force general purpose forces also run this full range—from supersonic fighter, carrying tons of bombs and rockets down to Special Operations units flying supplies in light planes into a remote village threatened with guerrilla subversion or attack.

Air Force general purpose forces are built and trained by the Tactical Air Command (TAC) and deployed to such overseas theater air commands as United States Air Forces in Europe and the Pacific Command. TAC and such theater air commands together comprise what are informally called "tactical air forces world wide." In maneuvers, overseas deployments, and combat, tactical air forces are teamed with Army and other forces in unified commands. The U.S.-based Strike Command includes all the combat-ready units of TAC together with all the combat-ready units of the Army not already deployed to overseas commands. Overseas or theater air force commands are similarly teamed with forces of other services in the European Command, the Pacific Command of which the U.S. Military Command Vietnam is officially a part, and other geographical unified commands.

SUMMARY

Aerospace forces are part of the "military instrument of national power," which is not the only such instrument. All the ways our Government has of wielding power and influence in the world—economic, political, psychosocial, and military—are instruments They are means of pursuing broad national objectives to insure the peace, security and well being of our citizens by encouraging other nations and peoples to build for a better future and thus secure a peaceful world, to deter aggressors by the reality of our military power, and to be able to fight to a successful conclusion should deterrence fail. The military instrument, of course, is primarily used for deterrence and war, but it also is an important instrument for peaceful aims.

Communist expansion and aggression, however, has been a fact the world has had to live with since the end of World War II, and this fact determines a more specific set of national objectives related to the containment of communism and the deterrence of Communist aggression in the various forms it takes—propaganda, political subversion, economic blackmail, and encouraging one small nation to attack another as well as outright major armed attack. In this kind of world, the Air Force as well as other elements of U.S. military forces has been employed in a variety of peaceful and cold-war missions—in such ways as show-of-force deployments, the Berlin Airlift, and numerous humanitarian missions to build good will.

Three basic principles govern the use of the military instrument as an instrument of force: deterrence, flexibility, and positive control. In accordance with these principles, and in face of the realities of the modern nuclear missile age, the traditional and official branches of the military service—Army, Navy, Marine Corps, and Air Force—have the duty of training, organizing and equipping forces which in actual operations are often grouped in various specified, combined, and unified commands. For budgeting purposes, military forces are classed as strategic offense, strategic defense, and general-purpose forces. In this text the emphasis will be on aerospace forces and the Air Force elements of the U.S. Military Establishment as they relate to these three categories, but roles of other services will be considered, and the final chapter will deal exclusively with Army, Navy and Marine aviation and missile elements.

REVIEW QUESTIONS

1. **What basic change of U.S. national policy in regard to foreign relations has occurred in the twentieth century?**
2. **What are some of the ways other than actual combat in which the Air Force has been used as an instrument of national power?**
3. **What three basic principles govern the U.S. military posture?**
4. **Define (1) strategic offensive forces, (2) strategic defensive forces, and (3) general purpose forces.**
5. **What is a specified command? A unified command? A combined command?**

THINGS TO DO

1. Begin a scrapbook with clippings of news stories and articles which illustrate the use of U.S. military forces in furthering national objectives by humanitarian activities.
2. Make a report on the Department of Defense, telling how it is presently organized and tracing the structural changes which have occurred in this Department since it was established in 1949.

SUGGESTIONS FOR FURTHER READING

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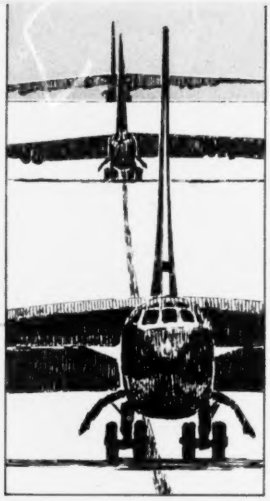
Chapter 2



Strategic Offensive Forces

THIS CHAPTER concerns the mission and operations of the Strategic Air Command (SAC), stressing its role as a deterrent force. The chapter also discusses the operational concepts governing the employment of both manned bombers and ICBM's, and describes the aircraft and weapons employed by SAC. When you have studied this chapter, you should be able to do the following: (1) explain the mission and objectives of the Strategic Air Command; (2) describe how this command is organized; (3) discuss SAC's capabilities as a strategic offensive force; and (4) identify and explain the uses of the aircraft and missiles used by SAC.

As NOTED in the preceding chapter, the major part of the strategic offensive power of the United States is vested in one Air Force command, the Strategic Air Command (SAC). Additional strategic offensive forces are provided by the Navy's Fleet Ballistic Missile submarines, which are discussed in Chapter 6. This chapter discusses the mission, organization, employment concepts, tactics, weapons and equipment of SAC, which possesses over 80 percent of the free world's total nuclear striking power in terms of TNT equivalent.[1]

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[1] The energy release of nuclear weapons is measured in terms of the amount of TNT required to produce an explosion of equivalent energy release. The units are the *kiloton* (equal to 1,000 tons of TNT) and the *megaton* (equal to 1,000,000 tons of TNT). Nuclear weapons range in power from a fraction of a kiloton or a few kilotons for defensive or tactical purposes to many megatons for strategic employment.

The present world is one in which aerospace power has removed the traditional barriers to aggression—land and sea. Today, any hostile force that has aerospace power can strike directly at its target and thus is a threat to our existence. To deter aggression, superior U.S. forces must be maintained. Should deterrence fail, either through miscalculations, error, or misjudgment, these forces must be able to survive, and strike and restrike the enemy effectively. A strategic force must be able to survive initial attacks of great strength and then prevail over the enemy.

THE SAC MISSION AND OBJECTIVES

The mission of the Strategic Air Command is to maintain a force instantly ready to conduct strategic air warfare, and related operations, on a global basis. The primary objective is to maintain strength in being with which to deter war, general or limited, on terms acceptable to the U.S. and its allies.

In a military sense, deterrence is the possession of sufficient military power to prevent another nation from taking aggressive action for fear of the consequences. This deterrence includes the military strength to prevail in war, the national will and determination to develop and employ this capability, and the acceptance of these facts by friend and foe. The SAC motto, "Peace is our profession," emphasizes this deterrence mission.

Two interpretations of deterrence have been developed. The first defines deterrence as the ability to destroy a high percentage of a nation's urban-industrial resources. Another interpretation is that effective deterrence depends upon possession of a striking power that threatens the destruction of substantially all of the enemy's nuclear delivery capability. This is called *counterforce.*

The Air Force subscribes to the second interpretation, which is based on a positive deterrent force with a counterforce capability. A threat to destroy a large number of Soviet citizens does not represent an effective deterrence of a Soviet attack against the United States. Nor would it deter a Soviet attack against a NATO country. This statement is based on the belief that the U.S. strategic capability must be strong enough to convince the Soviet leaders that the United States will live up to its collective security commitments with its allies. It must be made known that the United States will respond to an attack upon its allies, and that we have the capability to destroy the nuclear delivery elements of an aggressor's military forces. Perhaps now, it seems more clear that an inadequate capability would not deter war, but would actually invite it.

A counterforce capability also implies the capability to destroy the enemy's urban-industrial complexes, if necessary. However, we have no positive knowledge that the enemy will assess our deterrent power correctly, or that he will act in a rational manner. The *immediate* U.S. military objective in event of war would be to protect the Nation and its allies by destroying or neutralizing the enemy's military forces. To achieve the maximum degree of national security, a military force must be built not only to deter war but to win should war break out.

The Strategic Air Command, as we have noted, is a *specified* command, directly responsive to the President and the Joint Chiefs of Staff. Such (to be a little technical) is its status as an *employing* command—a command that takes action and employs resources. SAC is also an Air Force *providing* command—a command that builds resources. In this respect, its mission is to organize, train, equip, administer and prepare strategic air forces for combat including bombardment, missile, special mission, and strategic reconnaissance units. In this case the employing command and the providing command are one and the same. In other cases, as we shall see, they are different.

SAC ORGANIZATION

From its headquarters at Offutt Air Force Base, Nebraska, SAC conducts activities on bases spread throughout the world. The SAC Command Post, buried 45 feet underground, provides the Commander with around-the-clock control of all SAC operations. This is the location from which he would direct his forces in event of attack. The command post contains elements and agencies vital to wartime operations: communications, tactics, intelligence, weather, and liaison advisers. The control system that can dispatch SAC bombers and missiles to their predetermined targets is highly computerized and immediately responsive.

Centralized direction, vested in the Commander in Chief, SAC, includes the authority to launch, divert, or recall the strike force. However, only the President of the United States has the authority to release SAC weapon systems against enemy targets. While command and control is centralized at SAC headquarters, the responsibility to prepare this force for combat is decentralized to the lowest level of command which can perform this mission. In most cases, this is the tactical wing.

The major subordinate commands of SAC are the Second, Eighth, and Fifteenth Air Forces, the Third Air Division based on the Island of Guam in the Pacific and the First Strategic Aerospace Division. In general, the Eighth Air Force is responsible for units located within the eastern third of the United States; the Second Air Force, all units in the central portion (except SAC headquarters); and the Fifteenth Air Force, units in the western third (except the First

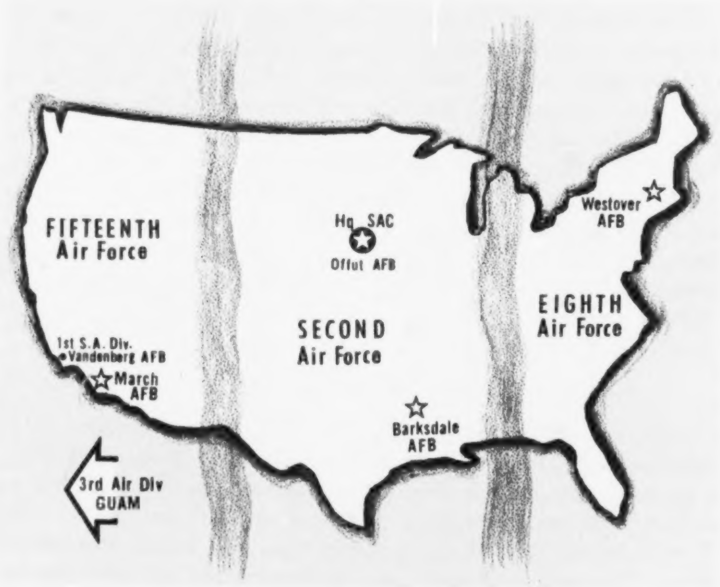
FIFTEENTH Air Force
Hq SAC
Offut AFB
Westover AFB
EIGHTH Air Force
SECOND Air Force
1st S.A. Div.
Vandenberg AFB
March AFB
Barksdale AFB
3rd Air Div GUAM

Figure 4. Strategic Air Command organization.

Strategic Aerospace Division at Vandenberg Air Force Base, California). There are several SAC units based overseas responsible to the numbered air forces in the zone of the interior. SAC operations in the Far East are the responsibility of the Third Air Division on Guam (Fig. 4).

Each major subordinate command headquarters has the following responsibilities: directing or supervising activities of assigned or attached personnel, and maintaining them in a state of operational readiness; manning, equipping, and training assigned and attached units to accomplish the command mission; planning for and participating in disaster relief and other domestic emergencies; and performing other special missions as directed by the Commander in Chief, SAC.

SAC consists of three types of divisions: (1) air division, which includes both bomber and tanker aircraft; (2) strategic missile division and (3) strategic aerospace division, which includes a mix of aircraft and missiles. Some divisions, as noted above, are separate commands; others are subordinate to numbered air forces.

The SAC tactical wing, not to be confused with wings of tactical air forces, is the basic unit for the employment of strategic air power. The principal types of tactical wings are designated according to their squadrons. The bombardment wing may include both bomber and tanker squadrons; the air refueling wing consists of two tanker squadrons; and the strategic missile wing consists of two or more missile squadrons. Whatever the type, the tactical wing has the capability to sustain combat readiness while operating under a condition of continuous alert, with combat-ready crews and combat-ready systems.

The wing commander is the combat force commander and his two deputies—one for operations and one for maintenance—provide a simple and clearly defined chain of command for these functions.

Combat support and medical groups provide operational support to the wing combat mission. The support varies with the conditions existing at the various bases. The combat support group on a SAC-owned base is responsible for operating the base and the combat support commander is designated the base commander.

SAC PREPAREDNESS

Two important aspects of keeping SAC ready for all contingencies are *survivability* and *training.*

Survivability

Since the United States is not a warlike nation, its planners must prepare for enemy attacks without prior warning. Among the top-priority SAC plans are those intended to insure the survival of a large part of the command's bomber and missile forces in the event of a surprise attack. Continuous advances in technology have increased this problem, so now the threat is within minutes instead of day or weeks. SAC planners must shape operational concepts around the premise that the U.S. must have the capability to strike back at an enemy that has struck first, without warning.

The Strategic Air Command has taken several measures to improve the survivability of its aerospace forces. These measures include establishing a fast reaction capability (alert), dispersal, hardening, and exploiting the inherent mobility of aircraft.

ALERT.—SAC depends heavily on the warning systems maintained by NORAD, (as described in the next chapter). SAC can launch its strike force within minutes after an alert has been given. SAC maintains an airborne alert that consists of a large number of heavy bombers, equipped with air-launched missiles, that are constantly in the air and ready to strike if the President should give the command to go to war.

Around the clock, SAC forces on ground alert are geared to react within the warning time provided by NORAD's Ballistic Missile Early Warning System (BMEWS), described in Chapter 3. However, the airborne alert gives the free world an extra measure of security and guarantees the destruction of the attacking enemy. At this time, the United States has 50 percent of its total bomber and tanker force on ground alert, prepared to react well within the warning time provided by BMEWS.

DISPERSAL.—Aircraft and missiles are "soft" targets, that is, they are easily damaged or destroyed by blast, even the relatively mild pressure from a bomb falling wide of the mark. Another problem is that SAC bombers are the type that require long, well-constructed runways and large well-equipped base installations, most assuredly top priority targets. The dispersal program spreads the force over a great number of bases and thus complicates the enemy's problem of destroying the force in one blow. Dispersal to a large number of bases makes more runways available for launching the force, so more SAC aircraft can become airborne in less time.

Dispersal is also exceptionally important in protecting the SAC missile force. All programmed missiles in SAC are dispersed so as to reduce the possibility of loss of more than one launch site to an enemy missile or bomb. This forces the enemy to program a much larger force to cover so wide an area. For this reason, the enemy planner must act with a much lower degree of confidence in his plans.

HARDENING.—The SAC missile force will probably have to endure the first portion of an enemy attack. In order for the missiles to be able to retaliate, the launch sites must be reinforced, or hardened. Early missiles were virtually unprotected above the ground. Later models were stored horizontally in shelters and had to be raised to fire. Then they were later placed vertically in silos protected deep underground. Finally, missiles have been designed to be stored in their firing position beneath the surface of the earth.

Since effective protection of runways has still not been devised, aircraft are still quite vulnerable to attack. However, fallout shelters for crews and improved communications contribute to the hardening of aircraft sites.

Training

SAC forces must maintain the highest possible level of operations. To do this requires constant training and practice. SAC forces continually carry out training missions which are conducted under simulated combat conditions. Each man in SAC has been trained so that in event of war he can aid in the accomplishment of the SAC mission of penetrating enemy defenses, seeking out and bombing the target, and returning to his home base.

Crews and pilots are carefully matched and they begin extensive proficiency training aimed at improving their ability to defend our nation. Constant training and frequent returns to the classroom keep crews current and proficient.

Missilemen, selectively chosen for their tasks, are trained at one of several ATC missile schools. Operational readiness training is then furnished by Vandenberg Air Force Base, California. The missile combat crew is considered qualified and combat ready only after it has demonstrated its ability to prepare a missile for launch within a specified time.

In addition to frequent and comprehensive evaluations by senior officers, SAC tactical units receive an operational readiness inspection (ORI) at least once each 18 months. An ORI is conducted unannounced at missile, bombardment, support, reconnaissance, tanker, and tanker task force units. The ORI tests a unit's ability to accomplish its assigned mission under realistically simulated wartime conditions. Such continuous and realistic evaluation keeps crews and units ready to perform their emergency war tasks if the need should ever arise.

EMPLOYMENT IN WAR

Various concepts of employment allow SAC to adjust the use of its forces to the particular situation. These concepts include target planning, positive control, counterforce strategy, tactics, and the strategic umbrella.

Target Planning

It is necessary that SAC have prepared plans for various types of strategic actions. These operational plans are prepared by the command and by the Joint Strategic Target Planning Staff (JSTPS) in accordance with direction provided by the Joint Chiefs. Created in 1960, the JSTPS is composed of highly experienced officers from the Army, Navy, Air Force, and Marine Corps. The staff reports to the Director who is also the SAC Commander in Chief. The JSTPS staff of 225 people is located at Offutt Air Force Base, Nebraska.

By planning for all the strategic weapon systems that would be used by the United States in a general war, the JSTPS assures integrated operations of our nuclear strike forces. SAC bombers and missiles, Navy Polaris submarine-launched missiles, and fighter-bomber and missile systems committed to strategic operations would all be closely working together to achieve the same end.

Positive Control Concept

This concept provides the capability to launch the manned force to meet an enemy attack as soon as a warning is received. Since only the President can authorize the use of strategic weapons carrying nuclear warheads, some means of keeping the manned aircraft force safe from attack had to be developed. This means, called the positive control concept, insures the survivability of the manned force. This is done through the authorization of the Commander in Chief of SAC to launch manned aircraft when he questions the survivability of the force on the ground, or when the current situation dictates that decision. After launch, the positive control aircraft proceed to their predetermined targets. These aircraft do not fly beyond the positive control line established by the Department of Defense unless so ordered through the Joint Chiefs of Staff. To prevent a possible mistake in intentions, the positive control line is far outside the scope of enemy radar.

If the order to proceed to target is not received by the time the aircraft reach the control line, they turn about and return to their home bases. The use of this procedure eliminates any possibility of accidentally or otherwise launching an attack without the necessary national decision.

To prevent an enemy from faking an attack to pull the alert forces out of position so that the real attack could be made without opposition, SAC maintains a constant strike capability at each base. If the enemy should succeed in diverting the initial alert force by means of a fake attack, aircraft on ground alert are combat ready and prepared to launch as replacements.

Counterforce Strategy

As previously noted, the counterforce concept is an essential component of the SAC mission. Counterforce strategy requires the following types of forces:

1. Forces that can survive, through early warning, quick reaction, dispersal, hardening, mobility, and weapon system variety, to strike back at an aggressor.
2. Forces that can penetrate to all necessary targets.
3. Forces that can conduct pre-attack and post-attack reconnaissance.
4. Forces that can conduct restrikes.
5. Forces such as aircraft and other aerospace vehicles and systems to seek out and destroy hard-to-find targets.
6. Forces that can have effective command and control of their units during combat.

7. Forces that can minimize damage to themselves and our people through *active* and *passive* defense measures.[2]

The conclusion, then, is that power that cannot prevail will not deter war. The Air Force concept is that a true deterrent requires forces capable of destroying any aggressor's military power so that he cannot wage war. Counterforce simply means a force that can win. Military power in war serves one purpose, to destroy the military power of the enemy. History shows this fact to hold true regardless of the century, the nations, or the type warfare. The primary objective of our counterforce policy is to destroy the enemy's nuclear capability that poses a direct threat to this Nation and its allies. Then, the secondary task is to destroy the enemy's war-making capability.

Tactics

All of the operational concepts which have been developed to insure survivability of the manned and unmanned forces are vital and fundamental. However, success really comes with the employment of aerospace weapons. Tactics have been devised which allow for penetration of enemy defenses. These tactics insure minimum destruction of our forces and maximum strikes against enemy targets.

Basically there are three tactical concepts: levels of attack, rollback, and restrike (Fig. 5).

LEVELS OF ATTACK.—This is the matter of choice of altitude for manned bomber penetration of enemy territory or the trajectory of a missile in flight. High-level and low-level penetrations have their respective advantages and disadvantages. Sudden changes of altitude, or use of different levels of attack by a manned bomber and its air-launched missiles might be effective tactics.

ROLL BACK.—This means clearing a path for the aircraft or weapon to reach the target. It includes both use of weapons against enemy defenses and use of *electronic countermeasures*. Electronic countermeasures include chaff, decoys,[3] and other devices used to fool, complicate, or impair the operation of enemy radar and other electronic sensors, communications, or weapon guidance systems. Certain air-to-surface missiles carried by SAC bombers are designed

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[2] For an account of these two defense measures, see Chapter 3.

[3] Chaff consists of narrow metallic strips of various lengths which, dropped from an aircraft, create false signals on radarscopes. An example of a decoy is the Quail, described below.

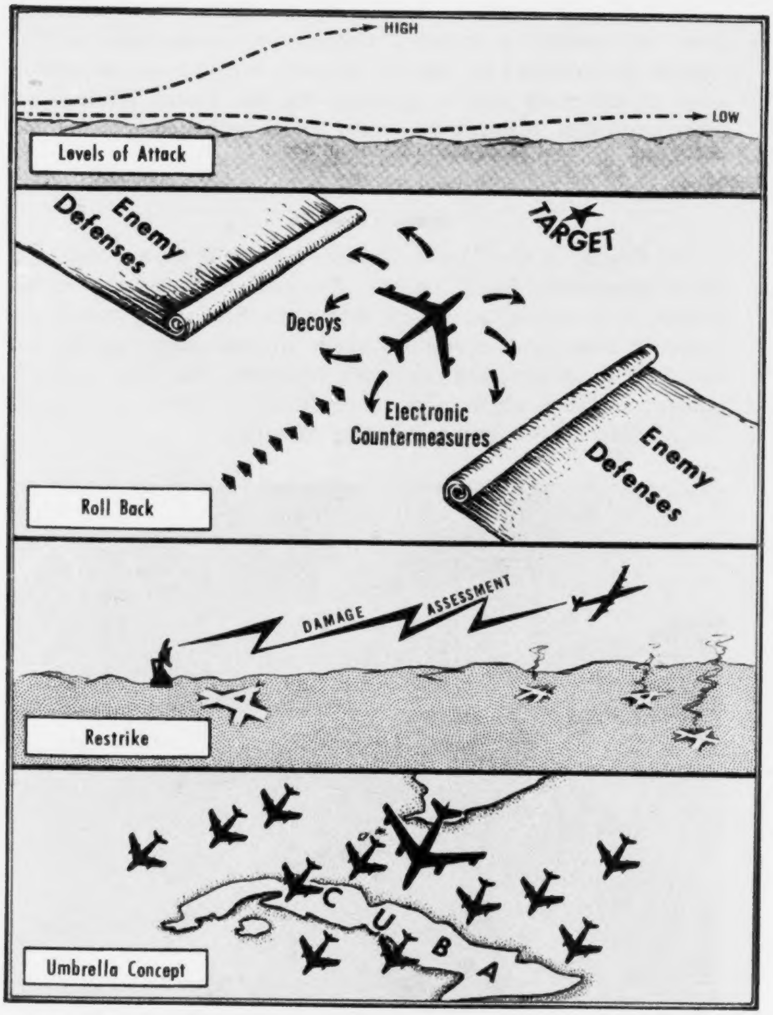
HIGH
LOW
Levels of Attack
Enemy Defenses
TARGET
Decoys
Electronic Countermeasures
Enemy Defenses
Roll Back
DAMAGE ASSESSMENT
Restrike
C U B A
Umbrella Concept

Figure 5. Strategic offensive tactics.

primarily for use against enemy aerospace defense sites and are thus part of the rollback tactic.

RESTRIKE.—The third aspect of strategic-offensive tactics is the capability of the restrike mission. Targets of unknown location and those not completely destroyed during first attacks must be discovered and attacked by manned aircraft. *Strategic reconnaissance* plays an important part in executing this last tactic. Bombers or other long-range, high-speed aircraft, loaded with photographic and electronic gear, perform this mission.

Strategic Umbrella

This concept is usually associated with a war mission, however, it also is important in lesser conflicts. By exercising its force in such a manner as to strengthen present deterrence, SAC can persuade the enemy to discontinue operations which are unfavorable to the free world. With an increased retaliatory capability, SAC can provide a strategic umbrella which allows other forces to operate and resolve lesser conflicts with greater freedom of action.

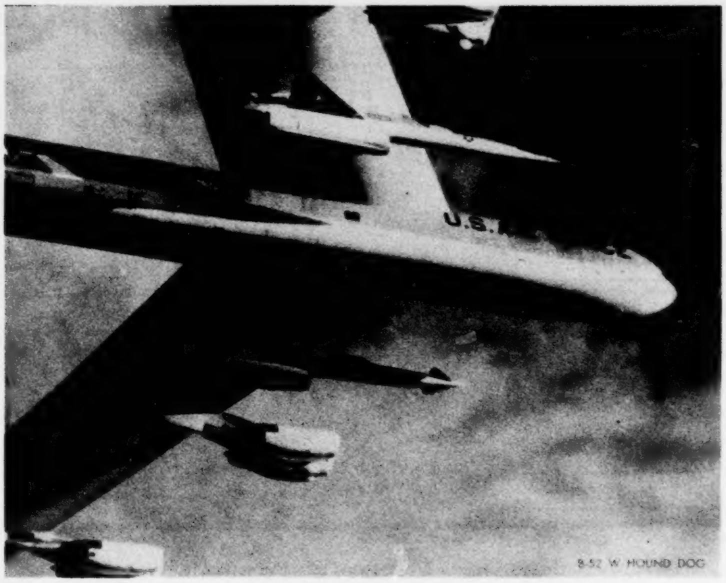

Figure 6. B–52 with Hound Dogs.

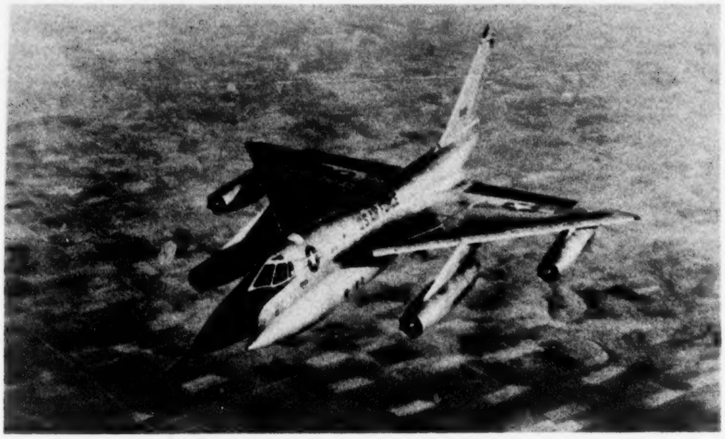

Figure 7. B–58 Hustler.

SAC RESOURCES

Since no one weapon system can meet all the required criteria of the strategic mission, SAC is equipped with manned and unmanned systems that are blended to employ certain techniques and tactics.

Four categories of equipment are described here: (1) manned aircraft, (2) missiles launched from manned aircraft either as air-to-surface weapons or decoys, (3) surface-launched intercontinental ballistic missiles (ICBM), and (4) the communications networks that provide command and control means for all these weapons.

Manned Aircraft

SAC manned aircraft include bombers, tankers, and strategic reconnaissance aircraft.

B–52 STRATOFORTRESS.—The present backbone of the SAC fleet is the B–52. (Fig. 6). This jet, with eight engines, can travel faster than 650 mph at altitudes above 50,000 feet. Normally carrying a crew of six, the Stratofortress can carry a nuclear payload and photo-reconnaissance equipment. Newer models of the B–52 carry such defensive armament as air-to-air missiles and rapid-fire 20 mm cannon of the "Gatling gun" type. The latest model (B–52 H) also has turbofan engines, which provide greater lift for these heavy aircraft.

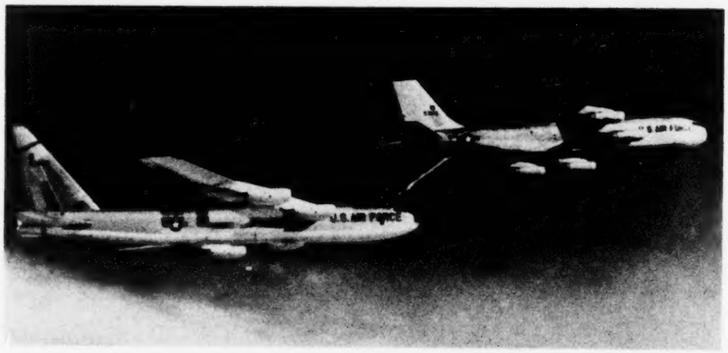

Figure 8. KC–135 tanker (above) refueling B–52 bomber (below).

The B–52 has played an important role in air operations over South Vietnam. Although it was originally designed to carry nuclear warheads, the B–52 has a large capacity for carrying thousands of pounds in conventional bombs.

B–58 HUSTLER.—Early in 1960 the Air Force began operating the Hustler. This aircraft, (Fig. 7) a supersonic jet bomber, can fly at altitudes and speeds far beyond all previous bomber types. The B–58 is the world's first supersonic bomber with the ability to fly from one continent to another without interruption. It is designed to carry nuclear weapons at twice the speed of sound (mach 2). Yet, the near future will also see this bomber replaced.

KC–135 STRATOTANKER.—Although most SAC bombers have intercontinental range, efficient operation of the SAC manned-bomber fleet and greater weapon payload is achieved with aerial refueling. The flying tanker used in this operation must be large enough to carry a big fuel cargo and fast enough to keep pace with the jet bomber it is linked with during the refueling. The four-jet KC–135 (Fig. 8) developed along the same lines as the large 707 commercial passenger liner but slightly smaller, answers this requirement. It can transfer fuel at the rate of three tons per minute.[4] SAC KC–135's also serve aircraft of other Air Force commands as aerial refuelers and have played an important role in tactical air operations over Vietnam. The same type aircraft also serves as the C–135, a cargo carrier for the Military Airlift Command (Chapter 5) and is refitted for special tasks. SAC EC–135's, loaded with sophisticated electronics gear, serve as flying communications ships and command posts.

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[4] Three tons equal about 1,000 gallons. For the sake of accurate payload/fuel calculations, the Air Force measures aircraft fuel by weight rather than volume. When it is necessary to express a quantity of aircraft fuel in gallons, a simplified rule-of-thumb is followed: 6 pounds equal one gallon, regardless of the actual specific gravity of the fuel, whether jet fuel (basically kerosene) or reciprocating-engine fuel (gasoline).

SR–71.—A new addition to the SAC inventory, the SR–71 is a strategic reconnaissance aircraft similar in design to the YF–12A interceptor which underwent testing for the Aerospace Defense Command (Chapter 3). It is equipped with electronic and photographic equipment for the reconnaissance mission, is capable of altitudes above 80,000 feet, and is one of the fastest jets currently flying, capable of reaching mach 3, or three times the speed of sound.

FB–111.—Another new addition is the FB–111, a somewhat larger bomber version of the "variable geometry" F–111 developed for tactical air forces and the Navy. The sweepback of its wings can be varied so that the wings can be extended straight out for takeoffs, landings and slow flight; folded back in a delta shape for supersonic flight at speeds up to mach 2.5; or partially swept back for long-distance cruising at best speed for fuel economy. Although this aircraft lacks the bomb capacity of the B–52, SAC hopes to replace part of the B–52 fleet with it because of its superior speed and its ability to use shorter runways and thus be better adapted to dispersal on numerous bases.

AMSA AND XB–70.—AMSA stands for "advanced manned strategic aircraft," a bomber project still in the planning stage with no specific information released about it. The XB–70, one lone specimen of which is still flying and undergoing experiments for both the Air Force and NASA, is a huge delta-winged supersonic aircraft once considered as a possible replacement for the B–52. It has a mach 3 speed and a ceiling of over 70,000 feet, but despite its great size (550,000 pounds maximum gross takeoff weight), it does not have the payload capacity of the B–52. One can guess what characteristics are being sought for the AMSA by imagining an aircraft that combines the best features of current and experimental SAC aircraft: such features as heavy payload and intercontinental unrefueled range of the B–52 plus the mach 2.5 or mach 3 speed of the fastest current jets, plus varied and sophisticated weapons for both primary mission and defense suppression, avionics, and electronic countermeasured devices. SAC's plans for the future do not envision ultimate replacement of all manned bombers with intercontinental missiles but a mixed force of both weapons. The future of the manned bomber in the strategic offensive force, however, will probably depend upon AMSA development.

Air-Launched Missiles

Currently, the manned bomber's primary weapon for strategic attack is the released bomb, which has no propulsion of its own after it leaves the aircraft. The aircraft, therefore, must penetrate all the way to its target to use its major weapons. Described below are three missiles launched from manned bombers. One, the Quail, is a decoy. The other two are designed primarily as *defense suppression* weapons. That is, they are designed primarily as weapons to be used at a distance against enemy air defense installations to clear the way for the oncoming bomber, part of the "roll back" tactic previously mentioned. In some cases, however, they can be used to attack the primary target itself.

HOUND DOG.—This missile has a range of over 500 miles. It has short, fin-like wings and an inertial guidance system and has been described as a "super elusive miniature supersonic airplane." The B–52 carries two Hound Dogs, one slung beneath each wing. The Hound Dog is not rocket powered but has an air-breathing jet engine that uses the same fuel as the mother ship. While still attached to the ship, the two Hound Dogs can be used as auxiliary jet engines to provide an extra boost in speed at a critical moment. This does not impair their range as missiles, for they can draw in more fuel from the B–52's main fuel supply.

SRAM.—The name stands for "short range attack missile," a project still on the drawing board. This missile could be carried on the B–52 or the FB–111 and is also being considered as part of the AMSA system. It would be smaller than the Hound Dog but could be carried on board a bomber in greater quantity.

QUAIL.—The Quail is a decoy currently carried by the B–52 as part of its electronic countermeasures system. It is only 13 feet long, but, when launched from a B–52, produces an image or "blip" on an enemy radar screen similar to that of the bomber itself. Its speed is about the same as that of a B–52 and it follows a path different from that of the mother ship to confuse the enemy defense system (Fig. 9).

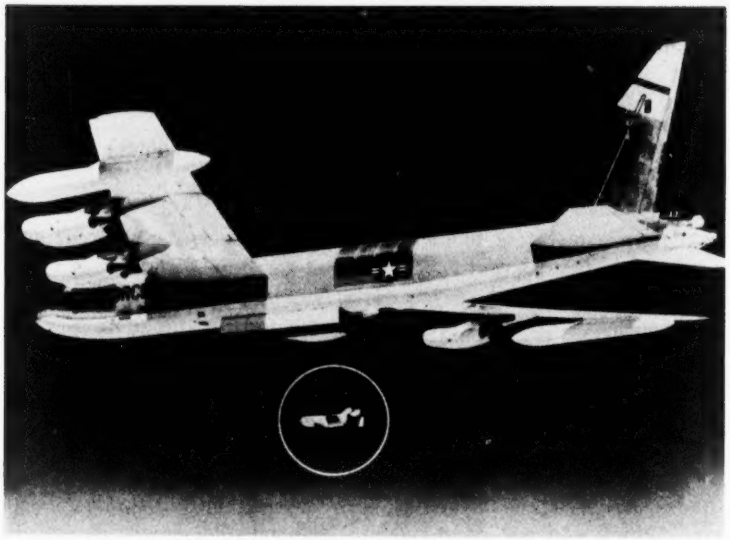


Figure 9. Quail decoy missile launched from B–52.

Intercontinental Ballistic Missiles

The other main part of SAC's strategic offensive power takes the form of intercontinental ballistic missiles, based in the United States and capable of reaching targets anywhere in the world. SAC currently has two types, the Titan II and the Minuteman.

TITAN II.—The Titan II, an improvement over the earlier Atlas and Titan I missiles, is the largest and most powerful intercontinental missile employed by the United States. The II model contains several improvements, such as an inertial guidance system, more-powerful engines, in-silo launch, greater reliability, increased payload, reduced launch time, and liquid-storable propellants.

MINUTEMAN.—This missile will become the primary component of the SAC intercontinental missile force. With a range over 6,500 miles, this ICBM can reach any target in the world. A force of 1,000 Minuteman missiles is planned for SAC. This solid-fuel missile is smaller and easier to produce than its predecessors, can be almost instantaneously launched, costs less to produce, can be left unattended for long periods of time, has fewer maintenance problems, and requires fewer people to care for it. All in all, the

Minuteman is a highly effective weapon that will bolster our defense posture while adding greatly to our offensive strength.

Command and Control

Strategic Air Command is such a diversified air command that it is imperative that it have an effective and reliable command and control system. Communications to and among SAC units must be secure and capable of handling all SAC missions. These communications facilities support SAC's combat ready status, support additional operations, and provide the means by which the Commander in Chief, SAC, exercises command and control of his organizations. To insure that command and control communications are responsive to the Commander's needs, SAC operates a complicated series of networks of land-line and radio communications.

All of the above systems provide the important link between Commander in Chief, SAC, and his various installations throughout the world. SAC is linked together through these different communications systems so that the organization can be effectively operated. The defense of the United States depends upon the continual efforts of the command and control system.

SUMMARY

The SAC motto, "Peace is our profession," indicates that deterrence of war is the primary mission of strategic offensive forces. To accomplish this mission, such forces must be able to destroy all or most of the enemy's nuclear destruction capability—the concept known as counterforce—as well as destroy a large proportion of an enemy nation's urban-industrial resources.

SAC maintains its headquarters and central command post at Offutt Air Force Base, Nebraska. Its command structure of three numbered air forces plus additional separate divisions embraces missile sites and bomber bases in the United States as well as overseas bases in Europe and the western Pacific. Although SAC is highly centralized as an operational command, directly responsive to the President and the Joint Chiefs of Staff, its mission of training and equipping forces for combat is decentralized, with much responsibility placed upon the tactical wings.

Survivability is an important concept in maintaining the SAC deterrent role in the face of an enemy capable of striking first and without warning. By means of dispersing and hardening its bases and missile sites and maintaining a posture of constant alert, with an airborne command post instantly ready to take over the command of forces should the main command post be destroyed, SAC insures its survival and ability to strike back.

Concepts governing the use of strategic offensive forces in war include target planning, positive control, counterforce strategy, tactics, and the strategic umbrella concept. Target planning is the responsibility of the Joint Strategic Target Planning Staff (JSTPS), whose members are drawn from all services. Positive control involves the concept of preventing accidental attack, as well as a command-and-control system that maintains constant airborne alert and insures Presidential control. Tactics include use of varying altitudes or levels of attack, roll-back of enemy defenses through electronic countermeasures and defense suppression weapons, and methods of restrike of targets not located or destroyed in the first strike. The strategic umbrella, by which an increased number of aircraft fly on airborne alert, is both a deterrent and a wartime type of employment.

Manned aircraft of the SAC force include the huge B–52 bomber, which has intercontinental range and a tremendous bomb capacity. In the Vietnam conflict, the B–52 has proved itself in tactical missions through use of its huge payload capacity for conventional bombs. The B–58 is smaller but has supersonic speed. The KC–135 stratotanker is a highly important member of the SAC team, which depends upon aerial refueling to maintain its capability for striking targets anywhere in the world. The mach 3 SR–71, equipped with special electronic and photographic equipment, is a new addition to the fleet, used for strategic reconnaissance. Another new addition is the FB–111, a somewhat enlarged version of the variable-sweep F–111. SAC for the time being continues to develop as a mixed force of both manned bombers and intercontinental missiles. The future of the manned bomber in SAC, however, seems to depend upon future manned-bomber design, now summed up in the initials AMSA, for "advanced manned strategic aircraft."

The released bomb is still the primary strike weapon of the manned bomber, but each B–52, also carries two air-to-surface missiles of supersonic speed and 500-mile range, the Hound Dog, primarily for use against enemy defenses but also capable of strikes on primary targets. A smaller defense suppression weapon called the SRAM (short range attack missile) is under development. Another main part of the Nation's strategic offensive power consists of two types of intercontinental ballistic missile, the Minuteman, which uses solid fuel, and the Titan II, which is liquid-fueled but also capable of instant launch from a hardened site. A third part of the total strategic offensive force is the Navy's Polaris-armed Fleet Ballistic Missile submarine force, discussed in Chapter 6. Also to be counted among SAC resources is its intricate communications system providing a means of positive but instant command and control.

REVIEW QUESTIONS

1. **Explain the meaning of "counterforce." What other type of deterrent power do strategic offensive forces employ?**
2. **Does SAC centralize its control of training, equipping, and otherwise preparing forces for combat as it does its operational function?**
3. **What is meant by "levels of attack?" "roll back?"**
4. **What level of command is required to authorize release of nuclear weapons against strategic targets?**
5. **Judging from the information given in this chapter, compare the advantages and disadvantages of the present SAC manned bomber and ICBM forces as strategic weapons.**
6. **Name the types of targets against which SAC weapon systems might be used.**

THINGS TO DO

1. Research the present status of the advanced manned strategic aircraft (AMSA), and the XB-70, for a classroom report. Newspaper accounts and articles in current periodicals such as *Aviation Week, Air Force and Space Digest, Time,* or *Newsweek* are likely sources for this information.
2. As you learned in this chapter, the Air Force subscribes to the counterforce concept of deterrence. However, there are those who support other concepts, usually referred to as minimum, finite, or parity deterrence. Organize a panel discussion in your class to research the arguments for and against the counterforce concept. Delegate members to present the varying viewpoints.

STRATEGIC OFFENSIVE FORCES

SUGGESTIONS FOR FURTHER READING

Coombs, Charles. *Aerospace Power,* New York: William Morrow and Co., 1966.

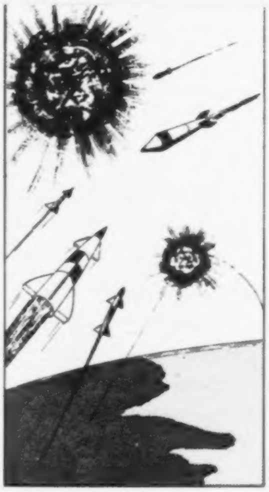
Glines, Lt. Col. Carroll V. *The Modern United States Air Force.* New York: D. Van Nostrand Co., Inc., 1963.

Goodie, Maj. Clifford B. *Strategic Air Command.* New York: Simon and Schuster, 1965.

LeMay, Gen. Curtis E. *America Is in Danger.* New York: Funk and Wagnalls, 1968.

[illegible]ining, Gen. Nathan F. *Neither Liberty Nor Safety.* New York: Holt, Rinehart, and Winston, 1966.

Chapter 3



Strategic Defensive Forces

THIS CHAPTER explains the mission of strategic defense and relates it to the concept of deterrence. It outlines the resources of the continental aerospace defense system and describes its organization under NORAD, a combined command controlling all the aerospace defense forces of the United States and Canada. The chapter then discusses the principles of aerospace defense operations in terms of the basic actions of detection, determination of intent, and destruction. When you have studied this chapter, you should be able to do the following: (1) discuss the responsibilities of NORAD; (2) explain the organization and operation of the continental strategic defense forces; and (3) describe the system used for detection, determination of intent, and destruction.

STRATEGIC DEFENSE, as we have mentioned, is the responsibility of a combined two-nation command, the North American Air Defense Command (NORAD). Strategic defense entails a set of problems and operations different from those of air or aerospace defense of deployed military forces in an active battle area. (These are discussed in Chapter 4, as a function of tactical aerospace forces). The present chapter, therefore, is mainly about NORAD, its resources and its operations.

THE MISSION OF STRATEGIC DEFENSE

The NORAD mission is stated very simply: "The aerospace defense of the North American continent." This is also a practical definition of strategic defense. A few words of explanation, however, are necessary.

NORAD's way of strategic defense is pure defense—involving no counterforce offensive action. It responds to enemy initiative. NORAD attempts to cope with the enemy attack only *after* it has been launched—with enemy aircraft that are already airborne and with missiles already streaking through aerospace.

This defense mission is part of the overall armed forces mission of deterrence of war. Before we attempt to explain this important fact, let us first explain some terms defining the main types of strategic defense.

Types of Strategic Defense

The main types of strategic defense are: active aerospace defense, passive defense, civil defense (a type of passive defense that merits separate discussion), and tactical warning.

ACTIVE AEROSPACE DEFENSE.—This means direct defensive action taken to destroy or reduce the effectiveness of an enemy aerospace attack. It includes the use of various kinds of weapons and electronic countermeasures.

PASSIVE DEFENSE.—This means all measures other than active defense taken to reduce the effects of hostile action. It includes the use of cover or shelter, concealment, camouflage, and dispersion. All military commands are responsible for their own passive defense; it is not a specific NORAD responsibility. The hardening and dispersion of SAC air bases and missile sites are an example.

CIVIL DEFENSE.—Civil defense is a passive defense designed or undertaken to reduce the effects of an enemy attack upon the civil population. It also deals with emergency conditions which would be created by such an attack and includes emergency repairs and efforts to restore power, transportation, communications, and other utilities destroyed or damaged by enemy action. A program for building, improving, equipping, and identifying public fallout shelters and instructing the public on their use is an important part of civil defense. In peacetime, the organization and facilities for civil defense can be employed in the event of nonmilitary large-scale disasters such as storms, floods, and fires.

Civil defense is a civil responsibility, but civil defense authorities work in close cooperation with the military. Two Federal agencies have main responsibilities in this field: the Office of Emergency Planning, a high-level advisory body assisting the President; and the Office of Civil Defense (OCD), an operating agency directly involved in civil defense activities, under the Secretary of the Army. OCD has personnel stationed at the NORAD Combat Operations Center and operates a warning network for alerting regional and state civil defense organizations. Other Federal agencies and departments also have civil defense responsibilities. The Federal Aviation Administration, for example, works closely with NORAD to control all civil aviation in a national emergency. It is the State and local governments, however, that are the key to successful civil defense, for they are charged with putting the program into effect. County-level organizations provide the means for small communities to help each other. It is the local organization that is best able to identify its own shelter needs; identify and mark possible shelters; plan for proper policing, provisioning and management of shelters; and set up local warning systems.

TACTICAL WARNING.—Tactical warning is officially defined by the Joint Chiefs of Staff as "a notification that the enemy has initiated hostilities. Such warning may be received any time from the launching of the attack until it reaches its target." Tactical warning is an important part of the NORAD mission. It is a warning that can be a matter of minutes or at most a couple of hours, and is provided by giant radar and other electronic means. Its purpose is to alert not only the defensive forces but also the whole Nation—including strategic retaliation forces and civil defense.

The Deterrent Role of Strategic Defense

All the organizations and activities defined above—active defense, military passive defense, civil defense, and tactical warning—play a part in helping the Nation maintain a posture of deterrence.

Strategic defense allows a nation to survive an enemy attack, respond to it, and carry on. An enemy who feels he cannot destroy our will and capacity to fight in one quick blow will reconsider and delay. If his forces are not large enough to overwhelm our defenses, he must have time to augment them. This gives *us* time to improve our defenses and produce further delays. As long as a potential enemy delays, he is deterred. In addition to the quantity of his strategic offensive force, he must also reconsider its quality. Are his crews skilled enough, his planes and missiles good enough, to overcome the defensive forces they will meet? Does he have effective electronic countermeasure devices? As long as a potential enemy is unsure of these matters, he is deterred.

A more immediate deterrent value of NORAD is the support it gives to our strategic offensive forces by means of its tactical warning capability. Tactical warning can alert retaliatory forces, get them airborne before they are destroyed, and reduce to minutes the time in which retaliation can be sent on its way.

PLANNING FOR STRATEGIC DEFENSE

Before examining the strategic defense system itself, let us consider some of the reasons why it is built along certain lines.

The Nature of the Threat

Under this heading we must consider two factors: potential enemy resources, and the strategic targets an enemy is likely to attack.

Resources of potential enemies.—A nation cannot wait for war to break out before it begins to size up a potential enemy. Whatever the hopes for diplomacy and "peaceful coexistence" may be (and these cannot be discounted, for the very concept of deterrence keeps such hopes alive), it is necessary to speak frankly of large and powerful nations which may have the resources, the ability, and perhaps the desire to launch a strategic attack upon our Nation. One such nation is the Soviet Union. Another growing power, Communist China, may soon have strategic capabilities also. In the past and currently it has been Soviet Union capabilities that have determined the character and deployment of NORAD resources. Like our own strategic offensive capabilities, these include manned bombers, intercontinental ballistic missiles, and other real or potential aerospace weapons.

Manned bombers.—Soviet bombers of strategic capability include a large 475-knot turboprop aircraft which we call the Bear, which has a range of over 6,000 miles without refueling and can double as tanker or bomber. Two faster aircraft capable of hitting North American targets are the Bison and the Badger, both turbojets. This bomber force was estimated to number more than 250 in 1964. In 1962, the Cuban missile crisis posed the additional threat of possible attack by supersonic tactical fighter aircraft capable of reaching vital targets in the southeastern United States. Today, development of manned aircraft of increased range, capable of striking from various directions, not necessarily over the polar route; and of "stand-off" bombers capable of remaining outside the present range of our defenses while attacking with air-to-surface missiles, are possibilities which our strategic defense planners must consider. For the present, enemy use of manned bombers for second-strike if not first-strike purposes is considered a likelihood.

Missile and space weapons.—In early 1966, the Soviets were estimated to have about 270 intercontinental ballistic missiles (ICBM's) in place, and this number is believed to be much larger today. Newest model Soviet missiles are located in hardened sites and capable of instant launch. The Soviets also have for employment in Europe numerous intermediate and medium range ballistic missiles, some of them mobile and truck transportable, with ranges of from 700 to 1,100 miles. Such missiles were the types emplaced in Cuba in 1962, the cause of the missile crisis of that year. Although the Soviets removed the missiles, NORAD has been forced to keep an eye in a southerly as well as a northerly direction ever since. Soviet development in submarine-launched ballistic missiles is believed to be less advanced than U.S. Polaris-Poseidon development, but improving. The possibility of an attack from any direction by an orbiting satellite is one that our strategic defense system takes seriously, special detection networks and weapons have been set up for countering this threat. A Chinese nuclear ICBM capability may, according to some experts, be a reality by the mid 1970's. This last threat, according to the Secretary of Defense, justifies the building of the new "thin" Nike-X antimissile defense system even if it is not an adequate defense against a massive Soviet ICBM attack.

TARGETS TO BE DEFENDED.—At what targets in North America would a strategic attack be directed? Answering this question is only in part a matter of predicting or guessing at enemy intentions. It is as much a question of analyzing our own military and economic resources and determining which are most important to our survival.

Since every target cannot be protected, a choice must be made. To make these decisions, the defense planner has a system of priorities to aid him in selecting those targets most likely to be attacked in the event of war. Estimates have been made that 50 nuclear strikes on 50 metropolitan areas of the United States would bring under attack half the Nation's population and three-fourths of its industry. We can also assume that the enemy has some kind of counterforce strategy in mind and will strike at certain military bases and sites as well as industrial centers.

Deployment Concepts

In deploying a defense system, it is necessary to consider several concepts or guidelines for operation.

TERMINAL DEFENSE.—Terminal defense, sometimes called point defense or local defense, is the concept of defending a specific geographic locality, such as a city, industrial complex, or military installation. Terminal defense weapons are usually highly accurate surface-to-air missiles characterized by rapid rates of fire, supersonic speeds, high-explosive or nuclear warheads, and an all-weather capability. Since terminal weapons against the manned bomber have short range, the only way to extend their protection is to increase the number of weapons in the defense system. Under the NORAD system, terminal defense is mainly an Army responsibility.

AREA DEFENSE.—The concept of area defense governs the Air Force role in NORAD. This is the concept of protecting larger areas in which a number of targets may be located. Area defense weapons, primarily long-range, all-weather manned and unmanned interceptors, reach out to disrupt an enemy attack long before it nears the target area.

DEFENSE IN DEPTH.—Taken together, area defense and terminal defense are parts of a larger concept called *defense in depth* (Fig. 10). A basic aerospace doctrine is that the enemy must be engaged as far from friendly territory as possible and subjected to continuous attack over the greatest possible distance. As the depth of the defense is increased, warning time is increased, more intercepts can be completed and more losses inflicted on the enemy force before it nears the target and encounters the terminal defense system.

FAMILY OF WEAPONS.—Closely related to defense in depth is the concept of diversity of defense weapons used against the approaching enemy. Both manned and unmanned systems are used, as well as weapons designed for high altitude and low altitude, long-range and close-in use. Some weapons depend upon highly sophisticated remote guidance; others are simpler and have the advantage of being less susceptible to enemy electronic countermeasures. Some have one type of anti-countermeasure device, some another. A nuclear defense weapon can be used effectively in some situations. In others, its use would endanger friendly forces and population. Today there is no one perfect weapon system that can be used against all types of enemy attack. By the same token, the enemy is not likely to have the one perfect electronic countermeasure or defense-suppression weapon that will work against all types of defense weapons. Therefore, defense in depth must be coupled with use of a varied family of weapons.

BALANCED DEFENSE.—Defense systems must be oriented toward the direction from which the enemy is expected to attack. In the past and to this day, no known manned bomber has sufficient range to permit it to deviate very far from a great circle route over Arctic or subarctic regions and reach a North American target with an effective payload. An ICBM, too, must fly a great circle course because

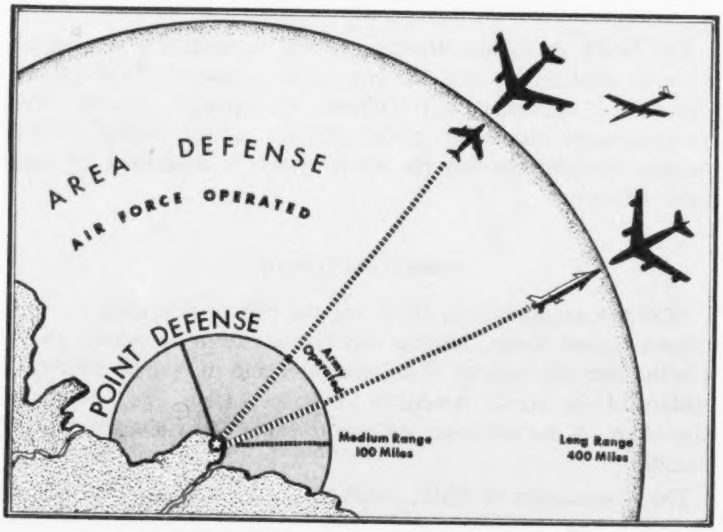


Figure 10. Defense in depth.

of the law of gravity. Nevertheless, as we have noted, there are weapons of increased range under development, other modes of attack, and other directions from which an aerospace attack may come. These dangers are increasing. Therefore, it is necessary to develop for the future a balanced system of defense against aerospace attack from any direction.

CENTRALIZED AND DECENTRALIZED CONTROL.—It is necessary to have a central command-and-control authority which knows the disposition of all weapons and all enemy threats so that the defense can be employed against the most serious threats first, then the lesser threats. It must have authority over units from different military services and be able to deploy forces from one area to another. For such reasons, the NORAD Combat Operations Center in Colorado, controlling the aerospace defenses of the entire continent, is established.

At the same time, efficient use of weapons depends upon local control. Furthermore, the principle of survivability demands that regions and divisions be able to carry on the battle independently in case they are cut off from the central system.

ORGANIZATION

The North American strategic defense organization is complex. We must consider not one but two super commands, NORAD and CONAD (Continental Air Defense Command). Under these are component commands of the different military services. Then we must consider the way the whole system is structured for aerospace defense.

NORAD and CONAD

NORAD, established in 1957, has the task of defending the continental United States, Alaska, and Canada from aerospace attack. It is the first two-country all-service command to operate within the borders of the North American continent. Under its *operational control* are all the aerospace defense forces of the United States and Canada.

The Commander in Chief, NORAD, reports to and receives instructions from both the Joint Chiefs of Staff and their Canadian counterpart, the Chiefs of Staff Committee.

How does CONAD fit into this scheme? CONAD was created before NORAD, in 1954, as a joint command over units from the United States Army, Navy, and Air Force employed in air defense operations. It was kept in being after NORAD was created so that there would be a means of control over U.S. air defense forces should there be a situation in which the United States had to act unilaterally, that is, without Canadian participation. In 1959, the Joint Chiefs of Staff redesignated CONAD as a *unified* command, having *operational command* over all the U.S. forces in NORAD. CONAD was given tighter control and increased authority over these U.S. aerospace defense forces.

The senior U.S. officer in NORAD is also the commander of CONAD. To date, this has meant that the commander of NORAD and CONAD is one person. As NORAD commander he is assisted by a mixed Canadian-American staff. Should a situation arise in which the United States must act without Canadian participation, U.S. NORAD staff members would either continue in the same duties or step up into the staff position occupied by a Canadian superior under NORAD. In the remainder of this chapter, for convenience's sake, we shall continue to mention NORAD from time to time, as the command that prevails over day-to-day North American strategic defense operations, but the fact that CONAD exists and can swing into action at a moment's notice must not be forgotten.

Component Commands

The mission of a component U.S. Army, Navy, Air Force or Canadian Air Force command under NORAD is to organize, train, equip, and keep in combat-ready status aerospace defense units for placing under NORAD's operational control. Administrative matters, supply, pay and promotions, keeping units on the alert and maintaining their proficiency with weapons and other equipment, are the responsibility of the component command. When the unit is on watch in aerospace defense it is controlled by NORAD, but it still "belongs" to its component command. "The Aerospace Defense Command provides; NORAD employs," is the way this relationship is explained in regard to one such component. The same principle applies to the others.

U.S. AIR FORCE AEROSPACE COMMAND (ADC).—The USAF Aerospace Defense Command (ADC) is the largest of these component commands, providing over 70 percent of NORAD's total personnel and resources.

Besides its basic organizing, training, and equipping tasks, ADC formulates aerospace defense doctrine and tactics that are employed by Air Force units. It also joins with other services to develop the doctrine for strategic defense of the United States.

Another ADC mission is to develop Air National Guard (ANG) resources used for air defense. ANG forces operate in a full-time partnership with all ADC forces. These ANG forces are organized by ADC and are made available to NORAD.

ADC provides several radar systems for the security of the United States and Canada. ADC personnel operate the Ballistic Missile Early Warning System (BMEWS), the Air Force Spacetrack System, and portions of the Distant Early Warning (DEW) Line. ADC also provides and operates direction and control centers such as SAGE and BUIC, (described below) and manned and unmanned interceptors.

ADC has a geographical field organization parallel to that of NORAD described below. ADC numbered air forces correspond to NORAD regions, and ADC air divisions to NORAD divisions. ADC also has one far-flung division devoted to space defense.

U.S. Army Air Defense Command (ARADCOM).—ARADCOM's contribution to NORAD includes Nike Hercules and Hawk surface-to-air missiles and crews, and the fire-distribution systems established in each defense area to coordinate their battle actions. The Army is supported by the Army National Guard, whose Nike Hercules units play an important part in around-the-clock defense missions. Recently authorized development of Nike-X antiballistic missile defenses by the Army will probably give ARADCOM a larger role in NORAD.

Naval components.—The Navy's contribution to aerospace defense at present consists of an element of the anti-satellite defense

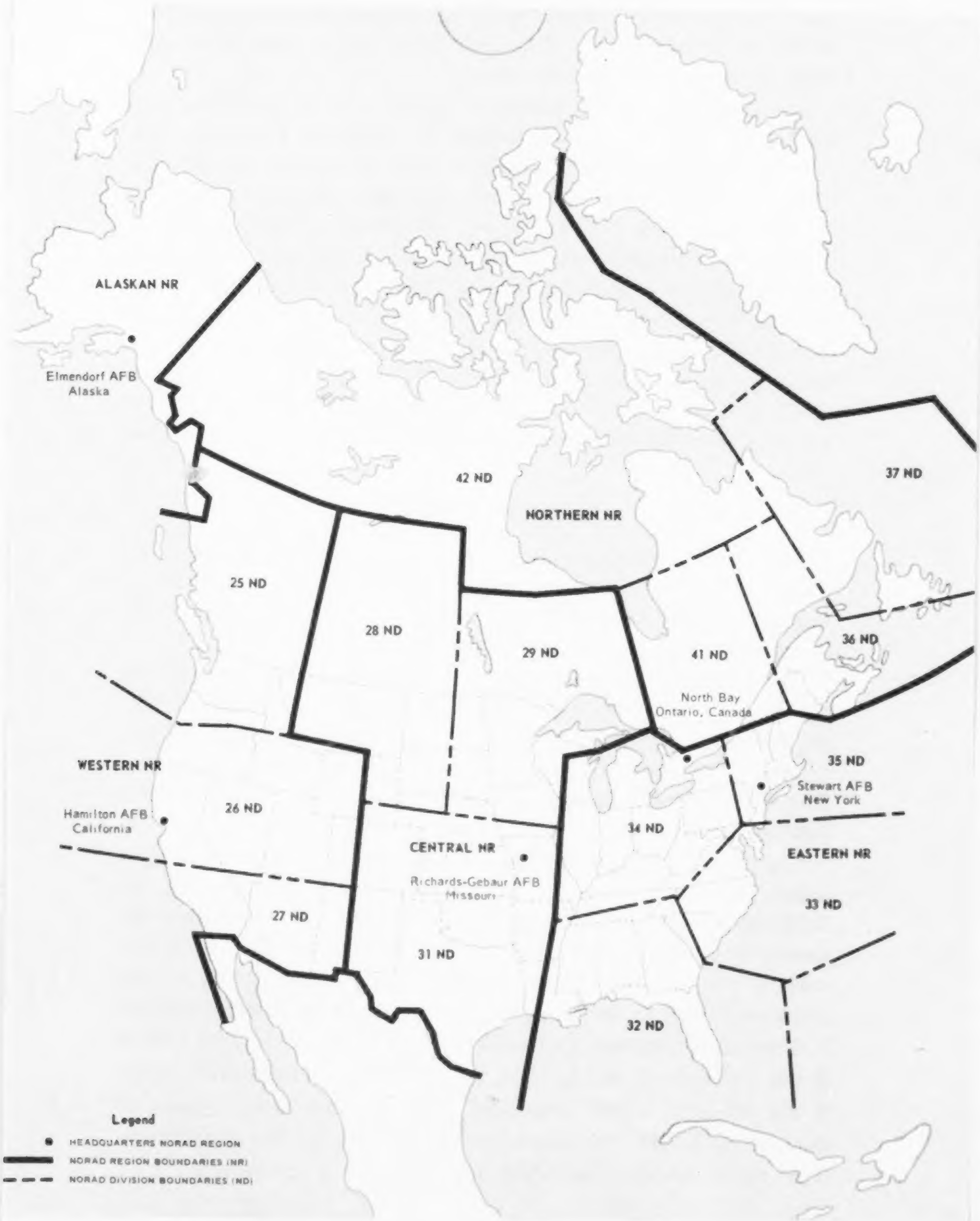

ALASKAN NR
Elmendorf AFB
Alaska
42 ND
NORTHERN NR
37 ND
25 ND
28 ND
29 ND
41 ND
36 ND
North Bay
Ontario, Canada
WESTERN NR
35 ND
Stewart AFB
New York
Hamilton AFB
California
26 ND
34 ND
CENTRAL NR
Richards-Gebaur AFB
Missouri
EASTERN NR
33 ND
27 ND
31 ND
32 ND
Legend
HEADQUARTERS NORAD REGION
NORAD REGION BOUNDARIES (NR)
NORAD DIVISION BOUNDARIES (ND)

Figure 11. NORAD Region

system called the U.S. Navy Space Surveillance System (SPASUR). In the event of air attack, Navy and Marine Corps fighter-interceptor units can augment NORAD forces.

CANADIAN FORCES AIR DEFENSE COMMAND.—In much the same way as the USAF ADC contributes to NORAD, Canadian ADC provides fighter-interceptor squadrons and Bomarc unmanned interceptor units. Canadian ADC also contributes heavily in the area of surveillance and in detection and identification functions.

ALASKAN COMMAND AND ALASKAN AIR COMMAND.—The Alaskan Command is a unified command with a twofold mission: ground and air defense of Alaska. The Alaskan Command is responsible to NORAD for the aerospace defense portion of its mission. This mission is largely fulfilled by the Air Force component of the command, the Alaskan Air Command (AAC). ADC interceptor units are rotated regularly into Alaska to augment the forces of AAC.

NORAD Field Organization

The NORAD field organization is geographical. As Figure 11 reveals, the North American continent is divided into five NORAD regions. One is in Alaska. The others cover broad sweeps of the continent without regard to national boundaries.

Each region commander has the responsibility to protect his area against air attack. He is responsible for evaluating threats, allocating forces, and supervising the air operations within his region. Although the region commander is subject to the decisions and judgment of the Commander in Chief, NORAD, he has considerable freedom in controlling operations within his area.

The regions are divided into smaller yet very important areas called NORAD divisions. The division is the only level in the NORAD system that actually directs weapons in intercepting unknown or enemy aircraft. The division commander has operational control over all assigned or attached forces and is charged with employing them in an actual battle. He maintains control through a direction center and exchanges data with higher control centers at the region level, but he must be prepared for independent action if cut off from higher command. The direction centers, most of them of the SAGE type (described further on), are the communications nerve centers from which the air battle is conducted.

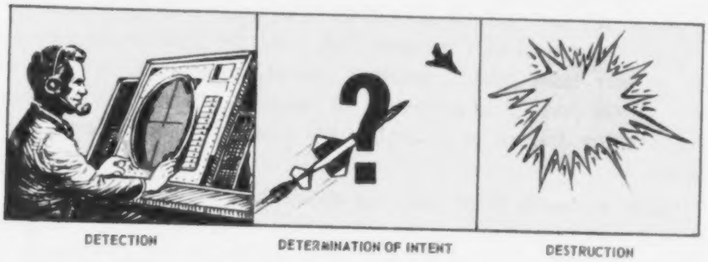
This geographic method of organization is at present determined by the needs of defense against the manned bomber threat. The tri-service detection, warning, and weapon systems that comprise BMEWS and the Space Defense System against missiles and satellites are at present independent of these regions and divisions. They are centered in the Combat Operations Center in Colorado and have units scattered across the Nation and worldwide. Future expansion of antimissile or antisatellite defenses may follow yet another pattern. There is nothing permanent about the NORAD field organization. It has changed several times before and will continue to change as the enemy threat and our own technology and resources change. A closer look at these resources, together with their principles of operation, follows.

RESOURCES AND OPERATIONS

Above, we spoke of organization and command structure. Think of these now in concrete terms. Instead of so many officers of different ranks, or a NORAD headquarters and regions and divisions marked out on a map, think of a network of interconnecting command posts equipped with all types of modern communications, computers, and automatic display equipment. Furthermore, this picture must be seen in active as well as concrete terms. That is, instead of so much "hardware"—weapons and electronic equipment—the system should be seen in operation.

The Three Basic Actions of Aerospace Defense

Whether the threat is a manned bomber or some other aerospace weapon, aerospace defense is a sequence of three actions: detection, determination of intent, and (if necessary) destruction.



Three basic actions of aerospace defense.

DETECTION.—This means the receiving of the very first information or signal that an airborne or spaceborne object of some sort is within range of a radar set or some other detecting instrument. It means locating this object but telling very little else about it—such as what it is, where it is headed, or whether it is friend or foe. Nevertheless, it is a vital step in the process, and a substantial portion of strategic defense resources must be devoted to this first task of producing, as early as possible, that spot of light or "blip" on a radarscope, or other signal that says, simply, "Something is there."

DETERMINATION OF INTENT.—If the detected object is out in space, is it a satellite of the United States, the Soviet Union, or some other country entered into the peaceful world competition for scientific knowledge and the conquest of space? Or is it something headed toward our continent or otherwise behaving like a weapon of destruction? Our BMEWS and Space Defense System keeps track of all objects in space and determines their intent. Manned aircraft pose an even more complex identification problem. Civil air traffic is always heavy over North American skies, and there must be a means of distinguishing it from possible hostile aircraft. The radars and computers of the ground system accomplish a great deal of this task. Nevertheless it is often necessary to dispatch or "scramble" a manned aircraft to intercept an unknown aircraft and determine its identity and intent by visual inspection.

DESTRUCTION.—As NORAD doctrine puts it, "If necessary, destroy." The manned interceptor is armed and prepared to do this if the inspected aircraft is determined to be hostile. NORAD employs a variety of manned and unmanned weapon systems for this purpose. One important difference between a manned and unmanned weapon system must be noted here. A manned interceptor retains to the last second the option to inspect or destroy. An unmanned weapon cannot be sent aloft until the decision to destroy has already been made. Another important principle is that, in view of the vast destructiveness of nuclear weapons, it is more important to destroy or neutralize the weapon than to destroy its carrier.

Below we shall twice consider these three actions and the resources used to accomplish them—once in regard to defense against manned bombers, and again in regard to defense against ballistic missiles and space weapons.

Defense Against Manned Bombers

As we have noted, the greater part of NORAD's resources as well as its field organization, are based upon the needs of defense against the manned bomber.

Detection systems.—The major parts of the system used for detecting manned bomber penetrations are (1) the Distant Early Warning (DEW) Line, (2) the contiguous radar system that blankets the United States and southern Canada, and (3) the airborne radar patrols extending this coverage seaward (Fig. 12). The DEW Line is a chain of heavy radar stations extending about 5,000 miles from the Aleutian Islands in the Pacific, across the top of North America to the eastern side of Greenland, and flanked on the east by the allied Greenland-Iceland-United Kingdom warning system. This line effectively covers all approximately direct routes from

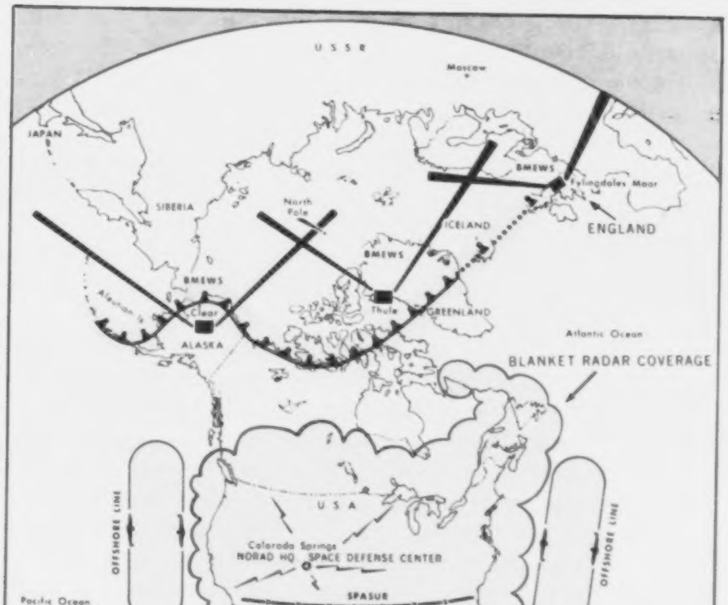

U S S R
Moscow
JAPAN
SIBERIA
North Pole
BMEWS
Fylingdales Moor
ENGLAND
ICELAND
BMEWS
BMEWS
Aleutian Is.
Clear
ALASKA
Thule
GREENLAND
Atlantic Ocean
BLANKET RADAR COVERAGE
OFFSHORE LINE
U S A
Colorado Springs
NORAD HQ
SPACE DEFENSE CENTER
SPASUR
OFFSHORE LINE
Pacific Ocean
MEXICO
CUBA

Figure 12. NORAD detection systems.

Soviet Europe or Asia to important U.S.-Canadian target areas. For a hostile bomber force to try an "end run" around this lengthy perimeter would be, to say the least, both time- and fuel-consuming.

Until a few years ago, two inner radar fences across Canada supplemented the DEW Line. These were called the Mid-Canada line and the Pinetree Line. The Pinetree sites are now incorporated in the contiguous radar coverage, where new installations of increased power now have enough northward range to make the Mid-Canada line unnecessary. The prime and gap-filler radars of the contiguous coverage provide high and low altitude coverage. Any aircraft flying within the area is observed by from one to four radar stations at all times. This coverage is extended seaward in both the Atlantic and Pacific by flying radar patrols—large EC–121 Warning Stars (Constellations equipped with bulging radar installations above and below the fuselage and other electronic equipment). Latest improvements on these aircraft include a system known as Airborne Long Range Input (ALRI), which extends their range of communications with land-based direction and control centers.

RESOURCES FOR DETERMINATION OF INTENT.—The next step, determination of intent of manned aircraft is a complicated process, best described by considering resources and operations separately. The physical resources are the interlinked nerve centers and their communications, forming control systems of three types known as manual, SAGE, and BUIC, together with higher command-and-control centers. All these resources are employed both in the determination-of-intent process and as a battle-direction means in wartime—the destruction phase.

Manual direction centers.—The manual system is rather outdated but survives in one or two divisions in the NORAD system and was until recently kept in being throughout the continent as a backup or emergency system. Under this system, the direction center is located alongside its own radars, since it has no means of long-range input. It has no computers to analyze information. Controllers are seated at radarscopes (as many as four in a large station) and can coordinate their actions by means of graphic information displayed on large status and control boards posted and kept current manually by busy airmen. These boards also serve as the basis of information to be relayed outside the direction center. Through these means, the direction center can keep watch on air traffic, identify tracks, control the takeoff and flight of interceptors, commit assigned weapons, and provide timely information to higher control centers or other direction centers.

SAGE direction centers.—Although a large manual direction center could handle as many as 24 intercepts at a time, this system by the early 1950's was deemed inadequate for air defense. It took several years to plan and develop an automated and computerized system to take its place, a system called SAGE, for "semiautomatic ground environment," which was installed throughout the country during the years 1958–61.

It is called *semi*automatic because, for all its computers and other electronic equipment, it permits such things as voice communications and manual inputs of information, and, above all, requires that important element of human decision in controlling and directing determination-of-intent and battle activities. No weapons are automatically launched by it. The term "ground environment" indicates the simple fact that the direction center is located on the ground and is not a flying command post.[5]

The building in which a SAGE system is housed is typically a huge windowless concrete blockhouse. It is called a "semihardened" structure because it is an effective fallout shelter with some degree of blast resistance but not enough to withstand a direct nuclear attack. Not the least of its features is its air conditioning system, designed for keeping its electronic machinery at proper operating temperatures as well as for the comfort of its occupants.

The direction center is connected by a variety of communications systems to its information sources, which include NORAD radar systems as well as those of the Federal Aviation Administration (FAA). Included in the information are weather data from both civil and military sources, flight plans, and information on defense weapon status. This varied array of information is fed into a huge data processing system or computer capable of producing 65,000 computations per second. It can receive, store, and calculate data and record answers in microseconds. Equally ingenious is the way this information is displayed before the controllers and commanders who use it in their decision making. Taking the place of the manually-posted status boards of the old fashioned manual direction center is a system by which data is electronically displayed on small console screens resembling radarscopes and relayed by the operator to a large screen in a theater-like room in the heart of the building where the controllers and commander are seated.

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[5] An aerospace defense flying command post concept is in the early planning stage with several manufacturers competing for a bid to construct it. It is called an Airborne Warning and Control System (AWACS). It is envisioned as a large, long-range jet aircraft, containing highly automated miniaturized equipment, capable of either teaming with ground-based systems or operating independently anywhere in the world. This concept carries the idea of survivability farther than does BUIC, described below.

The BUIC system.—BUIC stands for "backup interceptor control," an alternate system of direction centers intended to take the place of SAGE in case the SAGE installation is destroyed in war. The first such system, known as BUIC I, was manual. The current system, BUIC II, is based on the use of a small solid-state (transistorized) computer. Hence it can be housed in a smaller installation than that of a SAGE direction center. It has nearly all the capabilities of a SAGE system but a somewhat smaller capacity. A third phase, called BUIC III, is already under construction. It will provide more sites and an expanded capacity at each site. The idea of expanding the BUIC system is not that of decentralizing or subdividing control of a division. The SAGE direction center continues to be the primary control facility of a division. The BUIC station, located elsewhere in the division area, is manned on a standby basis, ready to take over the SAGE functions in an emergency.

Higher control centers—the COC.—Above the division and its direction center are two higher command-and-control levels in the NORAD system. These are the region and the Combat Operations Center. A regional control center is also a SAGE installation, built around computer and electronic display equipment. Its data input comes via the divisional centers, which weed out less important information before relaying it. Its commands similarly are relayed to missile and interceptor units via the direction centers.

The hub of the system is the NORAD Combat Operations Center (COC), housed in the world's most bombproof military installation, hollowed out of the core of Cheyenne Mountain, near Colorado Springs, Colorado. NORAD administrative headquarters are located at Ent AFB, in downtown Colorado Springs, and the COC formerly was also located there. The need for a completely hardened site for the nerve center for continental defense led to the construction of this nearby mountain bastion, deemed to be able to stand up to virtually any nuclear attack. There is at least a 1,200-foot thickness of solid granite atop its main installations. Access is by long, narrow tunnels burrowed deep into the hillside. Guarding the installations against blast waves penetrating these tunnels are two 30-ton steel doors in sequence (Fig. 13). Inside a vast man-made central cavern are several steel buildings, resting on heavy coil springs. These house the COC proper. Intricate air and water filtration systems protect against fallout.

The COC is not only the center for the antimanned bomber defense system, but it also houses the Space Defense System and receives inputs from BMEWS and the satellite-tracking system. Like the lower levels of the system, the COC is equipped with computers to receive, collate, and analyze information. The amount of data flowing into the NORAD COC is tremendous. It includes information on aircraft approaching the North American continent, suspicious submarines off the coast, the status of interceptors, and other defense weapons across the continent. Other inputs include weather data, the status of SAC and other armed forces, deployment of Communist forces, and degree of Communist military readiness. A system similar to that of a SAGE center relays data in graphic form to a large display screen before the eyes of the commander and his staff. Through an interlocking system, information shown on the NORAD display board is simultaneously shown to the Strategic Air Command, to the U.S. Joint Chiefs of Staff, and to the Canadian Chiefs of Staff Committee.

Manned aircraft determination-of-intent operations.—To return now to the second of three basic actions, how do the afore-

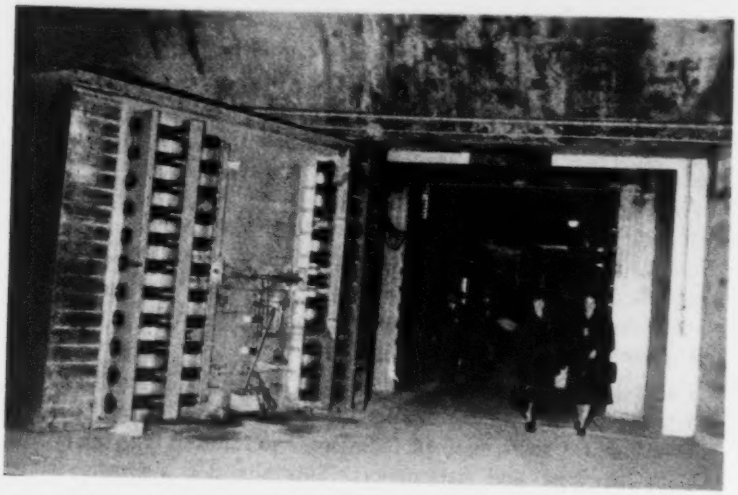

Figure 13. Blast doors at NORAD Combat Operations Center entrance.

mentioned systems operate to determine the intent of manned aircraft? Essentially, this means sorting out possible hostile aircraft from the heavy flow of normal civil and friendly military air traffic over the North American continent. About 200,000 flights take place over and around North America daily. NORAD's job is mainly to keep watch only on those flights that daily cross the continental perimeter or national borders. It assumes that all flights originating and terminating within the continental United States are friendly. It focuses its attention on the perimeters, locating its heaviest radar coverage there, and along the DEW line, and designates these areas as *air defense identification zones* (ADIZ). All NORAD regions and all but three division have an ADIZ segment within their boundaries, for which they have primary responsibility.

Before an aircraft may enter an ADIZ, the pilot must prepare and submit for approval a flight plan, indicating the route and time and place of zone entry. This is forwarded by the responsible civil or military authority to the defense system, where it is programmed into the SAGE computers so that it can be displayed at the appropriate time and compared with the track of the actual flight. If the two tracks compare within the allowed tolerances, the flight is assumed to be friendly. Anything irregular brings on a radio query to the aircraft in question, followed if necessary by a very rapid cross check with appropriate civil or military authorities. Experienced defense personnel have ways of determining hostile intent by track behavior. Certain changes in direction and altitude or other maneuvers suggest an effort to avoid or confuse the defense system. A number of tracks converging on a prime target area would also arouse suspicion. What has been described so far is the principal method of determination of intent, *flight plan correlation.*

Another method involves the use of electronic devices called transponders, which are installed on most U.S. military and some civil aircraft. These transmit coded identifying responses. This old system, called IFF (identification friend or foe) has been modernized so that the transponder broadcasts signals that appear as a distinctive symbol on a radarscope.

Finally, if all other means of identification fail to produce a satisfactory answer within minutes, the aircraft is classified as "unknown," and a swift manned interceptor is scrambled to identify it visually by type and nationality. This situation happens within NORAD on the average of six times a day.

Military-civil cooperation is necessary to provide a means of clearing the air for battle, grounding or diverting all nonessential air traffic (civil and nontactical military) when an attack is impending. In the United States there is a NORAD-FAA plan called SCATER (Security Control Air Traffic and Electromagnetic Radiations). Canada has a parallel plan called ESCAT (Emergency Security Control Air Traffic.)

BOMB ALARM SYSTEM.—The Aerospace Defense Command provides NORAD with a Bomb Alarm System which would give almost instant notice of a nuclear detonation on or near any of 99 estimated critical target areas. This leased system, built and maintained by Western Union, became operational in September 1962.

Around each of the 99 sites are three optical sensing devices spaced 120 degrees apart. These detectors, located several miles from the targets, cannot be triggered by anything but a nuclear flash (many times brighter than the sun). A nuclear explosion would be reported by the detectors before the arrival of a blast wave, which could destroy them or their connecting wires. If the blast were close enough to one of the detectors to destroy it before it could report, the other two detectors in the group would send the alarm.

Any nuclear explosion would be reported to the NORAD COC, Strategic Air Command, the Pentagon, and other vital military command posts. At these nerve centers, the information that a nuclear detonation has occurred would appear as a red light behind a glass map of the United States, indicating the specific area of the blast. Each display map has a communicator's panel which enables the operator to monitor the entire system. The status of every sensor in each location is shown on the panel. This Bomb Alarm System allows for faster verification of actual nuclear detonation than would be possible through normal communications channels.

THE DESTRUCTION PHASE—WEAPONS.—We come to the third of the basic actions of air defense, destruction of manned aircraft determined to be hostile. Here let us consider the weapon systems used for this purpose. One simple way of classifying NORAD's family of antibomber weapons is as manned and unmanned weapon systems.

Manned weapon systems.—The manned weapon systems available to NORAD, all provided by ADC, would include certain aircraft of a type called interceptors, and the air-to-air weapons with

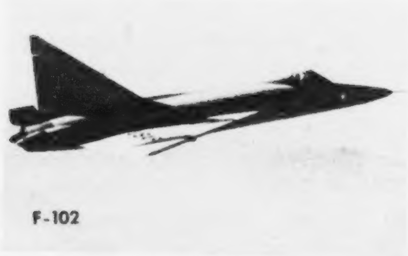

Figure 14. F–102 Delta Dagger.

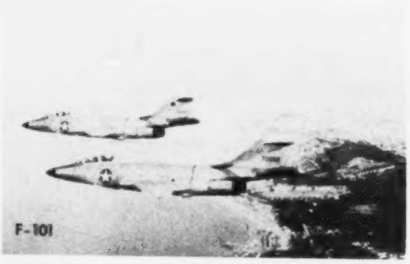

Figure 15. F–101 Voodoo

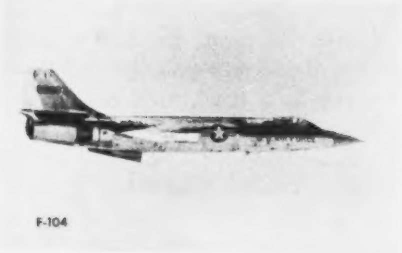

Figure 16. F–104 Starfighter.

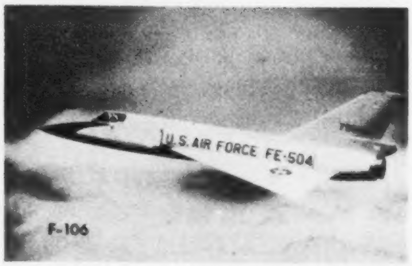
U.S. AIR FORCE FE-504
F-106

Figure 17. F–106 Delta Dart.

which they are armed. Let us briefly describe the aircraft first, then their armament. Described here are four supersonic fighters which make up the first-line ADC lineup, and one future possibility. (Certain older jets are still in Air National Guard air defense units but these are being replaced by F–102's.)

The F–102 Delta Dagger (Fig. 14) is the oldest fighter in the active ADC inventory. It has a speed of a little over mach 1 and is equipped with "data link" avionics which give it the capability of receiving radar-computerized guidance from the ground. It can reach an altitude of 50,000 feet and can launch a missile with an even higher operational altitude. It is armed with 2.75-inch folding fin airborne rockets (FFAR's) nicknamed the Mighty Mouse, and two types of Falcon missiles.

The F–101 Voodoo (Fig. 15) is a versatile mach 1.8 aircraft that has served tactical air forces as fighter and reconnaissance aircraft and NORAD as interceptor in both ADC and Canadian units. A big 48,000 pound aircraft, it carries a two-man crew. It can climb to over 50,000 feet. It is armed with Falcons and 20 mm. cannon.

The F–104 Starfighter (Fig. 16) is another versatile fighter in ADC, in other commands, and in allied air forces. It is the lightest interceptor (27,000 pounds), with a speed of mach 2 and an operational ceiling of over 70,000 feet. In its ADC version it is a single seater with limited poor-weather capacity, performing best in a clear air mass. Its main punch comes from its two heat-seeking Sidewinder missiles. It also carries a 20 mm. Vulcan cannon, capable of spewing out 100 rounds a second.

The F–106 Delta Dart (Fig. 17), weighing 30,000 pounds, resembles the F–102 but is a more advanced model; it is the most advanced interceptor in the ADC lineup. It is strictly an air defense interceptor. Its speed is mach 2 and its combat radius is over 600 nautical miles. Its armament includes Falcon missiles and Genie nuclear rocket. Its data link system with SAGE is even closer than that of the F–102. The ground controller can steer it out to the intercept point by means of its autonavigational system while the pilot focusses his attention on weapons rather than navigation. Even weapon firing is highly automated. The pilot selects the weapon, locks the radar onto the target, and presses a "trigger" which does not fire the weapon instantly but lets a computer determine the precise instant to fire.

For a brief period, ADC tested a new heavy long-range interceptor, the YF–12A, capable of reaching speed of mach 3 or over 2,000 miles per hour, also unsurpassed in range and altitude, armed with air-to-air missiles said to have 100 mile range and mach 6 speed. Unlike the F–106, this aircraft is designed to operate with a great deal of independence from ground control. Is it the answer to the "stand-off" bomber with its long-range air-to-surface weapons? Is it the answer to the problem of an enemy second-strike under conditions of a crippled ground-control system? As of this writing, further testing of the YF–12A has been discontinued.

The evolution of interceptor armament has proceeded from machine guns to heavier machine guns (cannons) to rockets and finally to large guided air-to-air missiles designed for one-shot kill. Cannons and multiple small rockets like the Mighty Mouse are designed to saturate with fire an air space ahead of the enemy plane. On interceptors today they are not considered as primary weapons but are still useful as reserve weapons, effective at relatively close range.

The larger rockets and missiles are the weapons on which interceptors place their main reliance for accomplishment of an intercept-

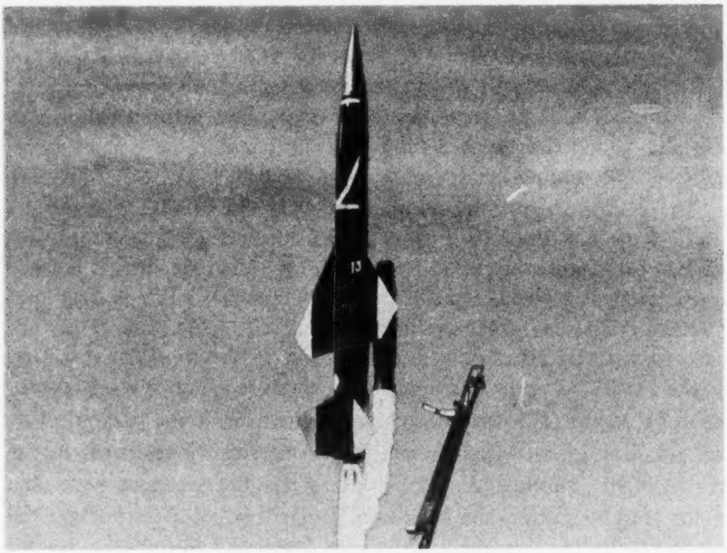

Figure 18. Bomarc unmanned interceptor.

to-destroy mission. The AIR–2A Genie is an 800-pound inertially-guided rocket with a nuclear warhead and a range of 6 nautical miles. It must fly a straight course but its mach 3 speed and large lethal radius make it effective against a target taking evasive maneuvers. The AIM–9D Sidewinder is an infrared-homing or heat-seeking missile which heads automatically for the hot tailpipe of an enemy jet. It has a range of 2 miles and a high-explosive warhead. Falcon is the trade name applied to a varied family of weapons. The AIM–4C and –4F, like the Sidewinder, are heat-seeking missiles. The AIM–4A and –4E are radar-guided missiles. All these have ranges better than 5 miles and high-explosive warheads. Another Falcon weapon, the AIM–26, is radar guided and can have a nuclear warhead. Weapons of the Falcon family have different types of guidance systems and various ways of coping with enemy electronic countermeasures.

Unmanned weapon systems.—These include one Air Force weapon, the MIM–10B Bomarc, and two Army surface-to-air missiles, the Nike Hercules and the HAWK. Following the NORAD concept of defense in depth, the Bomarc, with a 400-mile range, is an area defense weapon (Fig. 18). The Air Force prefers to call it an "unmanned interceptor" rather than a "surface-to-air" missile. It is a large winged, nuclear weapon with a dual propulsion system—a solid-fuel rocket motor for launch and two air-breathing ramjet engines for cruise. Its radar guidance is data linked with the SAGE or BUIC systems. It has a speed of 2,500 mph, and can reach an altitude of 100,000 feet.

Finally we come to the terminal defense weapons, the innermost ring around a vital target. Nike Hercules and HAWK missiles are operated by the Army through Missile Master and BIRDIE (battery integration and radar display equipment) fire control centers, which are in turn linked with SAGE/BUIC. The Nike Hercules uses solid propellants in both booster and sustainer motors. It has a 75-mile range and can reach an altitude of 100,000 feet plus. It has destroyed drone targets flying at more than three times the speed of sound. It can have either a high-explosive or nuclear warhead. The HAWK (homing all the way killer) is a surface-to-air missile developed especially to counter the enemy aircraft attempting to come in low to escape radar surveillance. It is a radar-homing weapon (that is, it is drawn toward the radar of an enemy aircraft), and its guid-

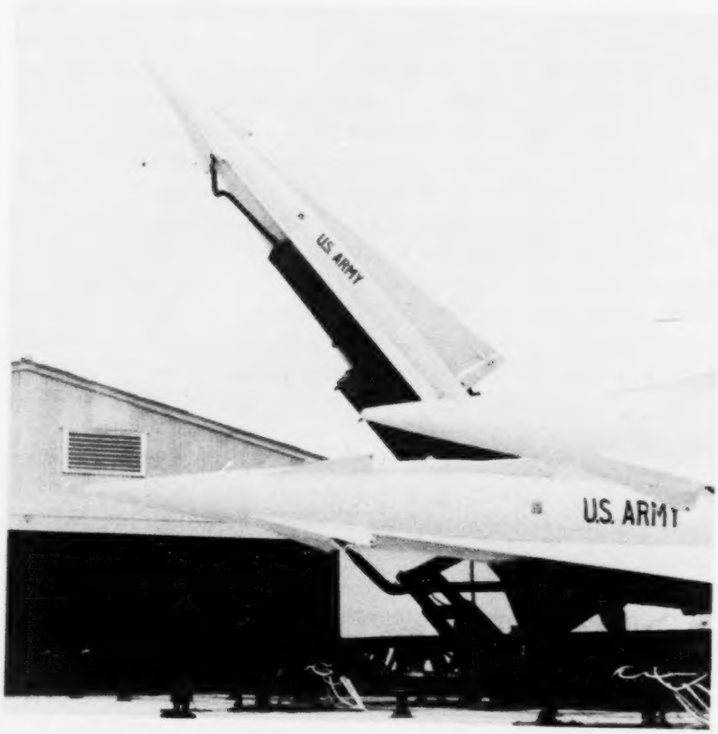

Figure 19. Army antiaircraft missiles — Hercules(L) and Hawk(R).

ance system is highly capable of discriminating against ground clutter. Both missiles are shown in Figure 19.

Defense Against Missiles and Space Weapons

The Nation's defense system against space weapons and missiles is far from complete. The best that can be said for it as of now is that effective surveillance systems are in operation, but weapons are lacking. In terms of the aforementioned three basic functions, the NORAD BMEWS and Space Defense Systems are capable of performing the first two—detection and determination of intent. To accomplish destruction, the beginnings of an antisatellite weapons system are in place, and an antimissile weapon system has been developed. Only recently has construction of it been authorized. Meanwhile, the first two of these functions accomplish the vital mission of tactical warning not only for NORAD but also for civil defense and SAC forces. Thus they aid deterrence and, if deterrence fails, save lives.

SYSTEM ORGANIZATIONS.—Considered here are two systems, BMEWS and the Space Defense System, the latter formerly called SPADATS (Space Detection and Tracking System). The Air Force has still another name for that part of the latter system which it mans, the Spacetrack System. Personnel of the ADC's Ninth Aerospace Division operate two of three BMEWS sites (the one in England is operated by the RAF, with ADC liaison) and the Spacetrack System. All told, 90 percent of the personnel and resources of the two systems is provided by the Air Force. Largest of the non-ADC components of the Space Defense System is the Navy's Space Surveillance System (SPASUR), but there are also contributions from the Army, the National Aeronautics and Space Administration (NASA), and civil sources such as scientific institutions and universities located the world over. Information from all these far-flung sources flows via an immensely complex communications system into the NORAD Space Defense Center, part of the Combat Operations Center in Cheyenne Mountain.

SURVEILLANCE.—The functions of detection and determination of intent can be summed up in the single word *surveillance*—keeping watch on the space surrounding the earth, tracking all objects moving therein, and automatically determining their identity and probable intent. First let us briefly describe how BMEWS operates.

Ballistic missile surveillance.—Since an ICBM must fly on a predetermined course, the path it follows during the early part of its flight determines the path it will follow during the remainder. Therefore, if two radar fixes can be obtained on the early part of the flight, computers can predict when and where it will land. For this purpose NORAD has had in place for several years three giant radar installations, located at Clear, Alaska; Thule, Greenland; and Fylingdales Moor, England (see again Figure 12). Their main physical features are fixed antennas as big as football fields, 400 feet long and 165 feet high (Fig. 20); backed up by huge globe-shaped scanner/tracker radars. These installations and their rearward communications constitute the Ballistic Missile Early Warning System (BMEWS). Other long-range radars, called Perimeter Ac-

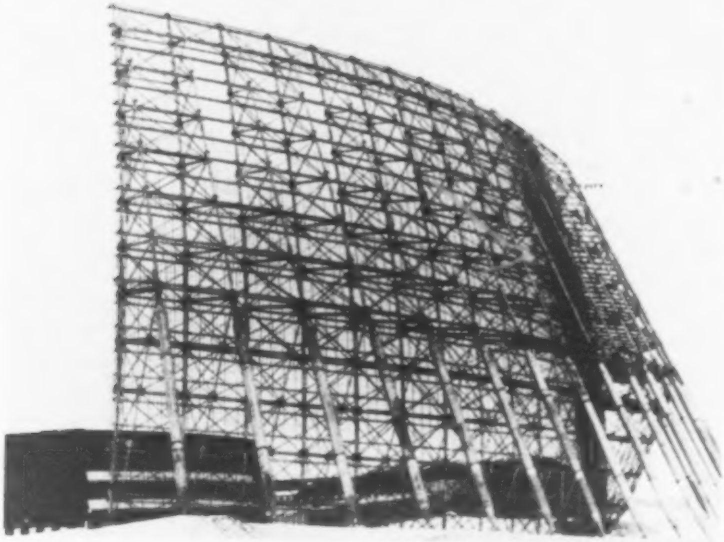

Figure 20. BMEWS antenna at Thule AFB, Greenland.

quisition Radars (PAR's), are to be built as part of the new Nike-X weapon system. A closer look at BMEWS, however, should suffice to tell us how this kind of surveillance works.

Detection up to 3,000 miles in space is not beyond the capabilities of BMEWS. A BMEWS radar emits its beams in two great, flat, fanshaped spreads, one above the other. Consequently a missile launched from an Asian or European site must pass through both these overlying fans, one after the other. Thus the two fixes are provided the computers, which solve the problem in microseconds. The solution is the determination of intent. If its destination is a North American target, its intent is hostile. If it is heading into orbit or outer space, its intent is still undetermined. The Space Defense System must then take it under surveillance.

The rearward communications system is multiple channeled, connecting with NORAD, SAC, and other strategic headquarters of the United States, Canada, England, and NATO. It employs some 223,000 miles of land and undersea cables and radio channels. Through such means computers feed data to computers. The on-site

BMEWS computer is called a Missile Impact Predictor. That at the NORAD COC is called the Central Computer and Display Facility.

The amount of warning time provided by the system is at present 15 minutes—enough, as we have said, to provide a deterrent factor. In the future, hopefully, it along with PAR will provide enough warning and fire-control data to permit the new Nike-X antimissile weapons to act effectively. Work is currently under way to extend the BMEWS warning capability to perhaps a half hour. This can be done by adding an over-the-horizon (OTH) radar capability. The principle of OTH is to bounce beams of radar energy off the ionosphere, deflecting them downward to provide detection capability over launching sites deep inside the Europe-Asia land mass.

Satellite surveillance.—The space threat includes two basic possibilities. A weapon sent aloft as an orbiting satellite can be given a signal that will suddenly change its course and direct it toward a North American target. There is also the possibility that a space-platform satellite that can launch a weapon toward earth will be developed. The attack can come from any direction. The problem is complicated by the fact that there are currently more than 1,000 man-made objects in orbit, and the number is growing as the United States, the Soviet Union, and other nations continue to explore and utilize space. Not all objects in orbit are active satellites. In fact, most of them are termed "space junk." The items include boosters, tankage, fairings, and other odd pieces which have gone into orbit along with the payloads. It is the task of the Space Defense Center to keep a running catalog of all these objects, processing some 300,000 to 400,000 observations a month.

Data comes into the Space Defense Center not only from radars but also from other types of sensors. BMEWS is the heaviest data contributor. Under construction at Eglin AFB, Florida, is a giant "phased array radar" oriented toward the south, which can follow multiple tracks of satellites, missiles, and even manned aircraft. Giant Baker-Nunn cameras operated at various points in the world use optical lenses and photography to trace tracks with extreme accuracy (Fig. 21). The camera can operate only at dusk because it must be in darkness while the target is illuminated, but it can pinpoint an object the size of a basketball 50,000 miles out in space. The Navy's SPASUR system follows still another principle. It erects a so-called "doppler fence" into space from a series of stations across the southern United States from California to Georgia. Transmitters

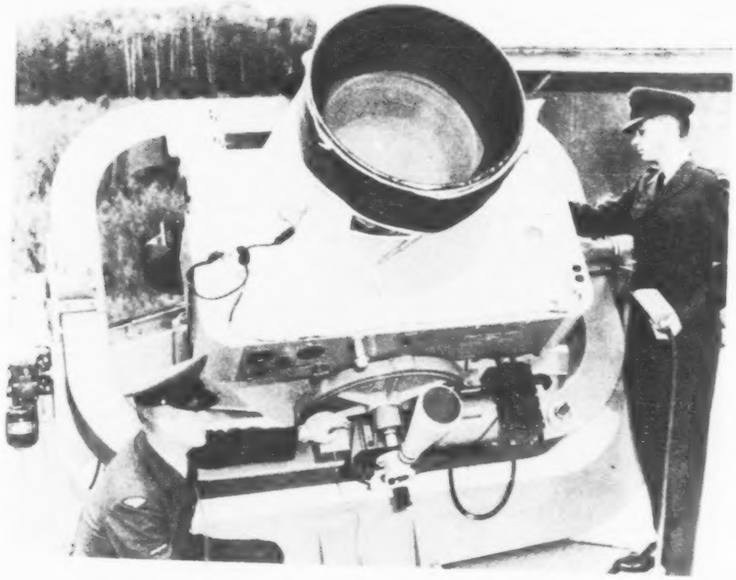

Figure 21. Baker-Nunn Camera.

send a vertical fan of energy thousands of miles into space and receivers detect any orbital vehicles passing through it.

By such varied means, new orbits can be detected and identified as to size, shape, and orientation. A complex of clues provides "determination of intent."

WEAPONS.—Here we can briefly note progress to date in space and antimissile weaponry, with a note on future possibilities.

Antisatellite weapons.—NORAD has in operation both Army and Air Force weapons capable of intercepting and destroying a satellite in space. The Army weapon uses the Nike Zeus missile; the Air Force uses the Thor. Both have proven effective during practice intercepts of some of our own satellites.

Antimissile weapon—Nike X.—The most promising antiballistic missile (ABM) system so far under development is based on an Army system known as Nike–X. In September 1967, after years of research and development, and also after long public debate over its effectiveness and cost, the Government announced that a "thin" Nike-X system would be built. A thin system is one that would deploy only enough weapons to serve as a defense against nuclear attack by the Communist Chinese or some other secondary nuclear power, or to provide protection for selected ICBM and radar sites to maintain deterrence capability. It would not provide an adequate defense of main population and industrial centers against a massive nuclear attack by a major aggressor, but would improve the Nation's deterrence posture against this possibility.

The Nike-X system consists of two types of missile (Fig. 22) along with radars and centralized computers to coordinate them and deliver firing signals to the weapons. The radars, in order of range, are the Perimeter Array Radar (PAR) for early warning and tracking, the Multifunction Array Radar (MAR) for midcourse tracking, and the Missile Site Radar (MSR) located at the site of the defense missile, for tracking the incoming missile on approach.

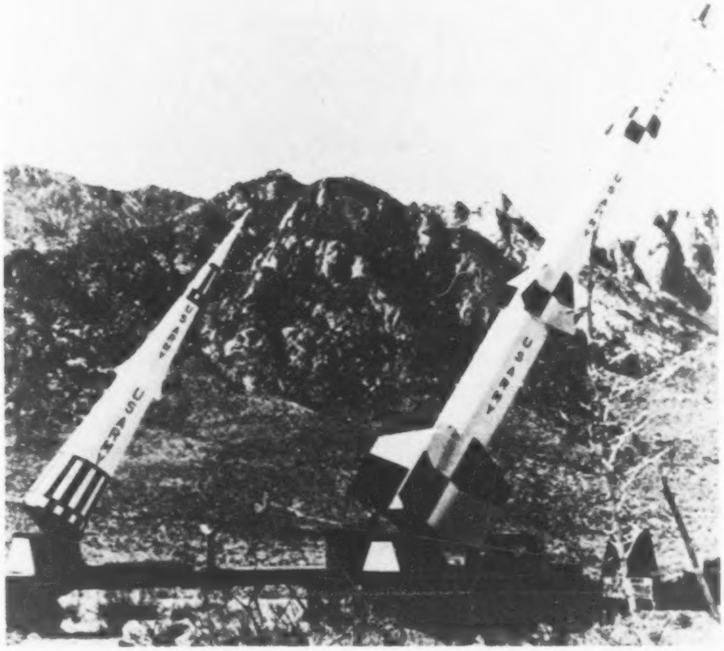

Figure 22. Nike-X missiles — Sprint (L) and Spartan (R).

The radar-computer system is capable of delivering in-flight correction signals to the defense missiles. A thin system can operate between PAR and MSR, without MAR. The costly and sophisticated MAR system, with its ability to handle many tracks and discriminate against decoys and other enemy electronic countermeasures, is essential to the heavier system, not at present authorized.

The two missiles used in the system follow the basic pattern, previously described, of area and terminal defenses comprising a defense in depth. Area defense is provided by the Spartan missile (an improved version of the Nike-Zeus, which demonstrated its ability to intercept a ballistic missile in 1962). This fast-reacting three-stage solid propellant missile is capable of intercepting an ICBM in space several hundred miles out from its target and destroying or neutralizing it by means of the radiations emitted from its exploding nuclear warhead. The other missile, even faster in its reaction, is called the SPRINT (Solid Propellant Rocket Interceptor). It has a two-stage solid-propellant motor. It also has a nuclear warhead and is a terminal defense weapon, designed for closer-range intercept of enemy missiles that get past the Spartan.[6]

SUMMARY

Strategic defense can be defined as "the aerospace defense of the North American continent," which is the stated mission of NORAD. Also included are passive defense responsibilities of all military commands, and civil defense responsibilities of civil authority at Federal, State, and local levels. Strategic defense is part of the larger mission of deterrence. It can cause delays in an enemy's strategic offensive plans. More immediately, it can provide tactical warning to alert offensive forces for their own survival and immediate retaliation.

To plan for strategic defense, it is necessary to consider first the resources of such potential enemies as the Soviet Union and Communist China in manned and unmanned, actual and potential, aerospace weapon systems. Then it is essential to identify the Nation's most important industrial and military target areas. Deployment of a defense system is based on combining area and terminal defenses according to an overall concept called defense in depth, designed to bring an invading force under attack as early as possible and keep it under attack as long as possible. A varied family of weapons complicates the enemy's problem of fighting off the defending forces. Although the main threat is still from the north, a balanced defense against attack from any direction is also necessary. Central control is required over all the aerospace defenses of the continent; yet regions and divisions must be able to carry on independently.

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[6] A question that has occasionally been raised by some citizens is whether nuclear weapons used in aerospace defense would endanger the very people and property they were designed to protect. For security reasons, information on nuclear weapons may be stated only in vague or general terms. Weapons designed for use against the manned bomber must be of relatively low energy yield and must be exploded only above a certain altitude. Under these conditions, neither blast, heat, nor radioactivity would occur in quantities harmful to people or damaging to structures on the earth below. Nuclear weapons used in antimissile or antisatellite defense can be more powerful, since they would be exploded at much higher altitudes, either in extremely thin atmosphere or in space. Blast and thermal effects would not be transmitted to earth at all. In a space burst, not even any noise would be heard. Radioactivity would either be diffused in space or spread around the world in the upper layers of the atmosphere, not concentrated in the area underneath the explosion.

One great combined command, NORAD, has operational control over all the aerospace defensive forces of the United States and Canada. Another large command, designated a unified command, is CONAD, which exercises operational command over all the U.S. forces (excluding the Canadian) in NORAD. U.S. officers in NORAD command and staff positions are prepared to assume the same duties as CONAD officers if a situation ever arises in which the United States must act without Canadian participation. Largest of the component commands under NORAD/CONAD is the Air Force's Aerospace Defense Command (ADC). Other components include the Army Air Defense Command (ARADCOM), a Navy space surveillance system (plus a naval capability for augmenting fighter interceptor forces), the Alaskan Air Command (part of the unified Alaskan Command), and the Canadian Forces Air Defense Command. The NORAD chain of command integrates the component commands at all levels, extending downward geographically through regions and divisions, each having its own electronically-equipped nerve center. The geographic organization is based on the needs of defense against the manned bomber threat. Separate systems are being built to cope with missile and space threats.

Whether the threat is a manned bomber or some other aerospace weapons, aerospace defense is a sequence of three actions: detection, determination of intent, and destruction.

The antimanned bomber detection defense begins with a 5,000 mile radar fence from the Aleutians to England, the greater portion of which is called the DEW (Distant Early Warning) Line. Closely overlapping radar coverage blankets the populated areas of southern

Canada and the United States, and the coverage is extended seaward by means of EC–121 Warning Star flying radar patrols.

Both the identification process and battle direction during the destruction phase depend upon electronic nerve centers at the divisional level interlocking with higher command-and-control centers at the regional level and the central command post in Colorado called the NORAD Combat Operations Center. Older manual-type direction centers survive in a few places, but the principal type of installation is called SAGE, which features computers and automatic display equipment, allows for both automatic and manual inputs of information from varied sources, and can even feed data directly into the navigational and fire-control systems of interceptor aircraft and other weapons. Orders to intercept and attack, however, are still dependent upon human decision. A backup system called BUIC, with smaller transistorized equipment, is prepared to take over in case of destruction of a SAGE direction center. The hub of the whole network is the Combat Operations Center, housed deep inside Cheyenne Mountain, Colorado, where control data from both the Space Defense System and the antimanned bomber defense system is analyzed and displayed, and transmitted to other strategic headquarters.

Identification or determination of intent of manned aircraft entering the continental defense perimeter is accomplished by establishing zones along this perimeter called Air Defense Identification Zones (ADIZ's) and comparing tracks of aircraft traversing these zones with previously filed flight plans. This is called *flight plan correlation.* The method is supplemented by use of automatic identification devices. On the average, it is necessary for NORAD to scramble an interceptor six times a day to make visual identification when these other methods do not bring positive results.

Weapons used in defense against the manned bomber include four manned interceptors: F–102 Delta Dagger, F–101 Voodoo, F–104 Starfighter, and F–106 Delta Dart. All are supersonic fighters, varying in their armament to include cannons, multiple rockets, and various larger air-to-air weapons, some high explosive, some nuclear armed, and employing a variety of homing and other guidance systems. To these area defense weapons the Air Force adds one 400-mile range 2,500 mph unmanned interceptor, the Bomarc. The Army's terminal defense weapons include two missiles, the Nike

Hercules and the HAWK, respectively, for high and low altitude interception and destruction.

Defense against ballistic missile and space threat today consists mainly of surveillance systems, providing an automatic combination of the functions of detection and determination of intent. The BMEWS system hinges on three giant radar installations located in Alaska, Greenland, and England. The radars provide two fixes on ballistic missiles as they rise from launching sites in Europe and Asia, and associated computers predict the time and location of their impact on a North American target. NORAD's surveillance system against satellites operates with a variety of radar and nonradar sensors, receiving inputs from BMEWS, the Navy's SPASUR doppler fence, and other devices operated by the Air Force, the Army, and civil agencies. By this means, it keeps a running catalog of satellites and other objects in orbit. The Space Defense System also has an antisatellite weapons capability in the Air Force Thor and Army Nike-Zeus missiles. An antiballistic missile weapon system is not yet in being at this writing, but an Army-sponsored project called Nike-X using two missiles called the Spartan and the Sprint, was recently authorized.

REVIEW QUESTIONS

1. How does strategic defense contribute to deterrence? More specifically, what can tactical warning contribute to deterrence?

2. Explain the terms "defense in depth," "family of weapons," and "balanced defense."

3. How is CONAD related to NORAD?

4. Explain the difference between "provide" and "employ" as command missions, in the statement "ADC provides; NORAD employs."

5. What are the three basic actions of aerospace defense?

6. Compare three types of direction center: manual, SAGE, and BUIC.

7. The NORAD COC is described as a "fully hardened" installation. What is meant by that term?

8. What is "flight plan correlation"?

9. What is "data link"? Are all interceptor aircraft so equipped?

10. Explain the basic principles by which BMEWS can predict the time and location of impact of an enemy ballistic missile.

THINGS TO DO

1. Organize a student panel to discuss the issues involved in the deployment of an antiballistic missile (ABM) system. Points to be considered should include: the location of the sites; the effect of such a program on the arms race between the United States and Russia; the deployment of a "thin" system as opposed to a "heavy" system; and whether or not any type of ABM system would have sufficient defense capability to justify its cost. In addition to current reports in newspapers and periodicals, an excellent discussion of the ABM question can be found in the supplement to Chapter 6 of the AFROTC text, *World Military Systems,* Vol. 1.

SUGGESTIONS FOR FURTHER READING

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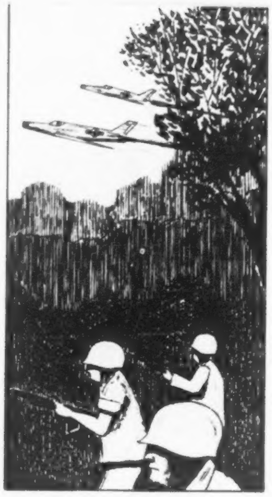

Chapter 4

Tactical Air (General Purpose) Forces

THIS CHAPTER states the mission of tactical air forces and describes their overall organization, which includes not only the Tactical Air Command (TAC) but the overseas theater commands to which TAC feeds resources and gives direct combat support when required. The chapter also explains the relationships between these forces and the other services through the medium of unified commands. The main types of tactical air operations are defined, and there are brief descriptions of tactical aircraft and weapons. When you have studied this chapter, you should be able to do the following: (1) explain the organization of the tactical air forces; (2) tell what basic tasks the tactical air forces perform and explain the operations involved in performing these tasks; and (3) identify the aircraft and weapons used by the tactical air forces.

As WE NOTED in Chapter 1, tactical elements of the U.S. Air Force are classed in the military budget as "general purposes" forces. These have the ability to further national policy in a wide variety of ways as well as engage in a variety of combat operations at all levels of conflict. During the past two decades, the course of history has caused the Nation's general purpose forces to be active, to bear the brunt of combat in Korea and Vietnam, and to make their presence known in other trouble spots throughout the world.

In passing, it must be mentioned that elements of the Strategic Air Command and the Aerospace Defense Command have also been active in overseas theaters in missions similar to those of general purpose forces. Anyone who reads newspapers or watches television knows about the employment of SAC B–52 bombers in the Vietnam conflict. ADC interceptor units have been deployed overseas for air defense of Okinawa and ADC EC–121 Warning Stars fly radar patrols off the coasts of Vietnam. Personnel of tactical commands have also been trained in interceptor operations at ADC schools. This chapter, however, concerns those Air Force commands mainly designed as general purpose forces, and the tactical air operations for which they are trained and equipped.

ORGANIZATION OF TACTICAL AIR FORCES

"Tactical air forces worldwide" is a name sometimes informally given to the Tactical Air Command (TAC) and the overseas geographic or theater air commands to which it provides resources. It is the nature of tactical air forces that they team closely with other military forces. As ADC is a part of NORAD/CONAD, so tactical air forces operate as elements of unified commands, both at home and abroad. Before we examine the structure of TAC, let us briefly consider the larger unified-command framework of general purpose forces and the overseas air commands.

Unified Commands and Overseas Air Commands

The unified commands include the U.S. Strike Command and overseas commands, notably the U.S. European Command and the Pacific Command. In these commands, in varying proportions depending upon the current world situation, are found the bulk of U.S. Army and Air Force general purpose forces plus substantial Navy and Marine strength.

THE STRIKE COMMAND.—In September 1961, the United States Strike Command was organized to combine all U.S.-based combat-ready elements of the U.S. Continental Army Command and the Tactical Air Command. USSTRICOM was formed to meet the increasing requirement for forces that strengthen our ability to deal swiftly and effectively with any limited war and at the same time to minimize the risk of general war.

The Strike Command, with headquarters located at MacDill AFB, Florida, has the mission of providing a general reserve of combat-ready forces to reinforce other unified commands and to perform such other tasks as may be directed by the Joint Chiefs of Staff. Although its structure and permanent components are Army and Air Force, there is provision for bringing Navy and Marine units into joint task forces of subordinate unified commands. The name "Strike Command" implies more than a pool of reserves for reinforcing other commands. It also implies a capability for swift action. The Strike Command can quickly assemble joint task forces of various sizes, even build other unified commands. In transferring a force to an overseas command, it plans this deployment right down to the precise moment in time and point in geography where the authority will pass from the Strike Command to the overseas command. The Strike Command is not self-sufficient but depends upon other commands for sealift, airlift, aerial refueling (recall that this is SAC's job), augmentation of forces, and other kinds of support. It provides command and administrative capability for securing such support.

MEAFSA.—The Strike Command also has an overseas area of responsibility of its own, not under any U.S. overseas command. This consists of the Middle East, Africa south of the Sahara, and southern Asia as far east as India and Pakistan, called MEAFSA (for Middle East-Africa-Southern Asia). Currently the Strike Command has no sizable force in MEAFSA, only a scattering of military assistance advisory groups and missions helping various friendly countries in that area, but it has the capability for rapid buildup and deployment of forces into the area if called upon to do so.

AFSTRIKE.—Since the Tactical Air Command contains various schools and training facilities, and units not yet deemed combat ready, it cannot be said that all of TAC is included within the Strike Command. All of the combat-ready elements of TAC, however, form a subordinate command under the Strike Command called the United States Air Force Strike Command (AFSTRIKE), parallel to the combat-ready elements of the Continental Army Command, called the Army Strike Command. The commander of TAC is also the commander of AFSTRIKE.

OTHER UNIFIED COMMANDS AND OVERSEAS AIR COMMANDS.—Besides the Strike Command and NORAD/CONAD, other unified commands are set up according to geographical areas. These are the U.S. European Command; the Pacific Command; the Alaskan Command (whose Air Force element, the Alaskan Air Command, is part of the NORAD/CONAD team as discussed in the preceding chapter); the U.S. Southern Command (Latin American military assistance); and the Atlantic Command (predominantly Navy but capable of drawing in other components). Two of these, European and Pacific, have the largest concentrations of tactical air strength and are briefly described here along with the major air commands which they include.

European Command and USAFE.—The European Command is committed to the North Atlantic Treaty Organization (NATO) under NATO's military headquarters, Supreme Headquarters Allied Powers in Europe. It includes major Army, Navy, and Air Force commands, the last called U.S. Air Forces in Europe (USAFE). The Navy command consists mainly of the Sixth Fleet, located in the Mediterranean. The main strike force of the Army is concentrated in Germany, where it is backed up by the main elements of USAFE's Seventeenth Air Force, but both the Army and the Air Force have components scattered among allied nations throughout Europe.

Headquarters USAFE is located at Lindsay Air Station near Wiesbaden, Germany. Subordinate USAFE headquarters are located in England, Germany, Spain and Turkey. The command's combat capability is assigned to three numbered air forces: the Third, with bases in the United Kingdom; the Sixteenth, in Spain; and the Seventeenth, mainly in Germany but with components throughout Europe.

Pacific Command and PACAF.—The Pacific Command, with headquarters in Hawaii, also has under it major commands of the Army, Navy, and Air Force, the last called Pacific Air Forces (PACAF). Army and Air Force subcommands are scattered throughout the vast Pacific area in such locations as Japan, Okinawa, Korea, Taiwan, and Southeast Asia. Currently there are three numbered Air Forces under PACAF: Fifth Air Force, with bases in Japan, Korea, and Okinawa; Thirteenth Air Force, located in the Philippine Islands; and the Seventh Air Force, in Southeast Asia, particularly Vietnam.

Of these locations, Vietnam currently draws the most attention. U.S. forces in this active combat area are under a unified command called the Military Assistance Command Vietnam (MACV), which is officially a subcommand of the Pacific Command and depends upon the latter for administrative and logistic support. MACV, however, is practically speaking a major unified command in itself, employing a substantial amount of the Nation's military resources. Tactical Air Force elements under MACV are commanded by the Seventh Air Force.

If this command structure seems confusing, one simple principle, flexibility, should be recalled. Commands are not permanent, nor are structures of command frozen. Some of the information above could be obsolete by the time you read these words. The unified command system, from the ZI-based Strike Command to the overseas commands, provides a flexible framework by which general purpose forces can exercise worldwide vigilance and be able to deploy rapidly and build up or reduce forces anywhere in the world as the situation demands.

The Tactical Air Command (TAC)

The mission of TAC is to prepare tactical units for employment overseas to produce combat-ready airpower for use by combat commands. Briefly, TAC must insure that tactical air forces are furnished with the necessary weapons, that personnel are properly trained to use them, and that the forces are located and supported so that they each perform their mission effectively.

Langley Air Force Base, Virginia, is the location of Headquarters TAC. From this center, TAC operates three numbered air forces: the Ninth, with headquarters at Shaw Air Force Base, South Carolina; the Twelfth, with headquarters at Waco, Texas; and the Nineteenth, located at Seymour Johnson Air Force Base, North Carolina.

The Ninth and Twelfth are similar in mission and functions. They are divided geographically, the Ninth located in bases in the eastern part of the United States, the Twelfth in the western. Between them, they divide the task of organizing, equipping, training, and administering assigned or attached forces to participate in tactical air operations. Different bases support schools as well as combat-ready AFSTRIKE units of different types of aircraft or weapons systems, such as the C–130 transport or the F–100, F–105, or other fighter types. Civil engineer training for overseas base construction is also a part of the training program.

The Nineteenth Air Force, which normally has no assigned units, has been nicknamed the "suitcase air force." It provides a highly mobile command element capable of assuming operational control of attached forces and deploying them to any part of the world. It is a specialist in building and moving that type of task force called the composite air strike force (CASF), described further on.

TAC organization and location of bases in the United States are shown in Figure 23. Six other organizations (independent of the numbered air forces) are also part of TAC. These have the status of doctrinal and technical centers as well as schools.

The Air-Ground Operations School (AGOS), located at Hurlburt Field, Eglin Air Force Base, Florida, provides continuing instruction in air-ground operations to insure interservice cooperation and teamwork. Personnel from the Air Force, Army, Navy, and Marine Corps attend the school, which is conducted by an interservice faculty.

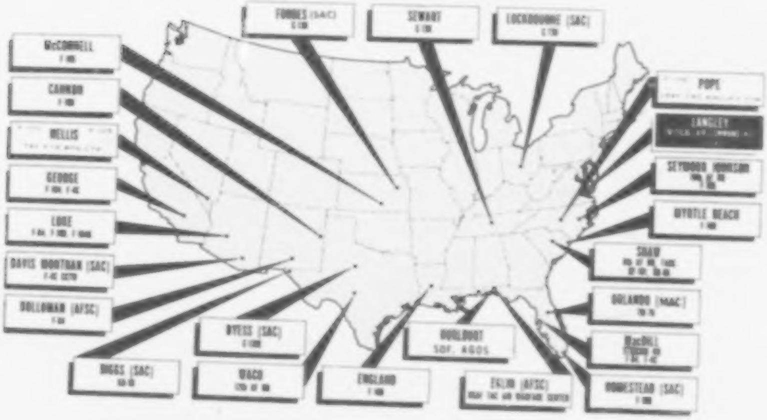
McCONNELL
CANNON
NELLIS
GEORGE
LUKE
DAVIS MONTHAN (SAC)
HOLLOMAN (AFSC)
BIGGS (SAC)
DYESS (SAC)
WACO
ENGLAND
FORBES (SAC)
SEWART
LOCKBOURNE (SAC)
POPE
LANGLEY
SEYMOUR JOHNSON
MYRTLE BEACH
SHAW
ORLANDO (MAC)
MacDILL
HOMESTEAD (SAC)
EGLIN (AFSC)
HURLBURT
SOF, AGOS

Figure 23. Tactical Air Command bases.

The Tactical Air Reconnaissance Center (TARC), at Shaw Air Force Base, South Carolina, assists in developing doctrine, testing new techniques and equipment, and training combat-ready crews and ground technicians in all aspects of tactical aerial reconnaissance.

The Special Operations Force (SOF), formerly designated Special Air Warfare Center (SAWC), located at Hurlburt Field, was established to develop techniques, equipment and doctrine to be used in special operations, which includes so-called "counter-insurgency" and a wide variety of combat and noncombat air activities associated with guerrilla warfare, military civic action, and psychological operations.

The Tactical Air Warfare Center (TAWC) tests Air Force tactics and techniques for use in joint operations with the Army. The center gathers data from special studies, engineering tests, and field exercises to improve tactics. The center is located at Eglin Air Force Base, Florida.

The USAF Tactical Airlift Center (TALC) at Pope Air Force Base, North Carolina, tests and evaluates tactical airlift and aerial delivery systems.

The Tactical Fighter Weapons Center (TFWC) at Nellis Air Force Base, Nevada, conducts operational tests of tactical fighter weapon systems and munitions.

TACTICAL AIR OPERATIONS

In preceding chapters we have considered two basic missions of aerospace forces—strategic offense and strategic defense. Now that we have taken an overview of the organization of tactical air forces, let us consider the third basic combat mission of aerospace forces, tactical air operations. Instead of protecting a homeland or directly attacking an enemy's home-based war-making capabilities, tactical forces are designed to combat enemy military forces in the field.

Tactical air operations are defined as air operations against an enemy's forces or against targets that are directly related to the support of these forces in action. There may be borderline cases. Is a given target or a given air defense battle tactical or strategic? Is a given mission more appropriate for Army aviation or tactical Air Force elements? (The problem is discussed in Chapter 6). In most cases, however, the functions of tactical air forces are well defined, and the methods for conducting tactical air operations equally well defined, as worked out by the doctrinal, training, and maneuver programs conducted by the unified and Air Force commands described above.

Tactical air forces perform five basic tasks: (1) gain air superiority, (2) isolate the battlefield (interdiction), (3) give close air support to ground forces, (4) provide tactical air reconnaissance, and (5) provide tactical airlift. Additional activities come under the heading of "special operations." The range of these activities makes TAC the most diversified command in the Air Force. Before we describe any of these activities or operations, however, let us consider the matter of deployment, or bringing tactical air forces into position where these tasks are performed.

Deployment—the Composite Air Strike Force (CASF)

Since the Tactical Air Command acts as a providing command for overseas air command, deployment of forces overseas is in itself an important part of its operations. This is done in four ways:

1. Steady replacement. Personnel are assigned overseas for a period of time and are individually replaced. Equipment is replaced as needed.

2. Unit deployment. After a unit is declared combat ready and committed to AFSTRIKE, it is assigned to an overseas theater and

men and equipment are transported there by air and sealift as a whole unit.

3. Unit rotation. A unit is deployed overseas for a short period of time to augment the forces of an overseas command, and is replaced by a similar unit when it returns home.

4. CASF deployment. This is described below.

Recently, with the focus on Vietnam, where prolonged combat has been going on, the first two of the above methods have been the major part of TAC deployment activity, and the third program has been somewhat curtailed. These facts do not diminish the importance of the capability to form and deploy a Composite Air Strike Force (CASF). Maintaining this capability in a world in crisis is one of TAC's most vital responsibities.

In the CASF, TAC has provided the free world with a potent answer to the acute problem of "local wars." The CASF is TAC's initial response element and is ready to go anywhere in the world on short notice. Minutes after an alarm signals an enemy aggressive action, powerful tactical air elements are in motion. The CASF normally includes squadrons of tactical fighters, reconnaissance units, (supersonic jets with photo, weather, and electronic intelligence-gathering capability), scores of aerial tankers, plus a fleet of globe-circling troop carrier transports with combat personnel, supplies, and equipment to sustain the "packaged" fighting force for 30 days. At any time, TAC can back up a CASF by moving various other TAC forces. The Nineteenth Air Force, as we have noted, provides the command element for putting these wheels in motion.

A Composite Air Strike Force arrives in place combat ready, capable of performing any type of mission from a leaflet drop to a nuclear attack. Various types of vehicles are equipped to carry any selected armament, including 20 mm cannon, high explosive bombs, napalm, missiles, and nuclear weapons. Clearly then, the CASF commander has a variety of weapons at his disposal for any required mission. This type of combat ready force has been employed in the past, in the Middle East and around Taiwan, both in 1958.

TAC does not believe that CASF can win a local war. However, CASF offers the means to place a strong, versatile and self-sufficient combat element in a remote place in minimum time. This combat element can begin offensive operations or can defend the area until additional forces arrive. CASF is a proven deterrent to a local war and is the element that denies any sudden attacker that "reasonable chance" of victory. Thus, the main advantage of CASF is the flexibility derived from being able to tailor the force to meet the situation.

The Five Basic Tasks

In action, tactical air forces provide, as we have noted: (1) air superiority, (2) interdiction, (3) close air support, (4) tactical air reconnaissance, and (5) tactical airlift. The first three of these are firepower tasks—the ways in which the guns, bombs, and rockets of tactical fighters and attack planes are used. Sometimes called the "threefold mission," these were recognized and set forth as basic air doctrine during World War II and are still important today. The other two are equally important combat tasks associated with the tactical air mission.

AIR SUPERIORITY.—A bit of historical background is of interest in regard to this doctrine. In the early stages of World War II, especially in the North African campaign, tactical air forces were under the control of ground forces and were employed almost exclusively as a close air support weapon. Because U.S. fighters failed to attack enemy air bases, they failed to gain air superiority, and losses were high. Furthermore, the close air support mission itself was ineffective because of failure to put priority on air superiority. The matter was discussed with allied military leaders at the Casablanca conference early in 1943, and by mid-1943 the U.S. Army (which then included the air forces) published a field manual, *The Command and Employment of Airpower* which set forth the doctrine of the threefold mission, of which air superiority came first.

Air superiority is best gained by attacking and destroying enemy aircraft and missiles on the ground, before they can become airborne. Targets include enemy airfields and immediate supporting facilities, aircraft, radar and other electronic guidance and control facilities, missile stockpiles, and missile launch sites.

Counterair operations also include air-to-air combat with enemy air forces that have become airborne. In the tactical concept, air defense or interceptor operations similar to those described in the preceding chapter would be included. Under battlefield conditions, ground-control installations cannot be as large or elaborate as the SAGE direction centers of NORAD. Instead, radars and communications facilities must be small, rugged and portable, and they must

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perform a variety of tactical air control tasks as well as ground-controlled intercept. TAC supersonic fighters do not differ much from ADC interceptors as aircraft, but they are differently equipped with weapons and fire-control systems for more versatile employment in both air-to-air combat and air-to-surface attack.

INTERDICTION.—The object of interdiction is to deny the enemy the use of communications and supply routes. Interdiction operations are designed to disrupt the flow of supplies, men, and equipment through destruction, delay, or harassment, so that the enemy forces are weakened. Although interdiction operations are rarely 100 percent successful, they usually succeed in great measure. An important point stressed in the 1943 manual and still applicable today is that control of airpower must be centralized, with command exercised through the air commander. This principle is especially important in both air superiority and interdiction operations. The ground commander has a say in selection of interdiction targets, but the best source of intelligence on location and importance of these targets is provided by tactical air reconnaissance, and the timing and tactics of interdiction attacks is best controlled by the air commander. Usually it is not an emergency task or "rush job." Results are not immediate. World War II is full of examples of the success of this doctrine after it was applied. The advance of U.S. and allied ground forces in Italy was stalled with heavy losses in 1943. After an all-winter-long air interdiction campaign against roads, railroads, bridges, and communications behind enemy lines, the way was paved for the victorious advance up the Italian peninsula in 1944. The importance of interdiction has been repeatedly proven—in Korea, Vietnam, and other theaters of conflict.

CLOSE AIR SUPPORT.—The objective of close air support is to assist the ground forces in the immediate battle area by delivering aerial firepower against surface positions. This kind of operation demands the closest kind of teamwork with ground forces. Targets are picked by ground commanders, and the success of tactical air close support missions often depends upon the speed with which the fighters or attack planes respond to their requests. Army forces have firepower of their own, some supplied by Army aviation. (More on this subject is found in Chapter 6). Uses of Air Force close-support firepower, therefore, must be limited to those situations where it is most effective. It supplements, but is not a substitute for, the firepower of ground forces. A general rule is that it is best employed when ground troops are moving, either advancing or retreating, and not in a static situation.

TACTICAL AIR RECONNAISSANCE.—This is the oldest of military air missions, predating the airplane itself. Union forces in the Civil War used captive balloons to observe enemy positions. The aircraft first employed in World War I were also used for observation, before uses for aerial firepower developed. Today tactical aerial reconnaissance makes use of the most sophisticated electronic and photographic devices to report activity behind enemy lines—buildups, troop movements, location of air bases, missile sites, radar stations, supply and transportation lines, and concentration points. It is closely associated with the air superiority and interdiction missions described above, but it is also of high importance as a means of supplying ground commanders with information. Aerial reconnaissance is the greatest single source of intelligence for use by both ground and air forces of the Strike Command. Weather reconnaissance is employed to determine conditions over a route to be flown, or a location where aerial refueling will take place. Some aircraft are equipped with search radar and electronic sensors for locating enemy radar and missile-guidance installations. Others are equipped for visual observation and photography. Ground support of aerial reconnaissance is important, for speedy processing, study and interpretation of photographs. Under development is a system for aerial processing of photographs and their delivery to forward ground positions by parachute drop.

TACTICAL AIRLIFT.—The airlift capability of the Air Force is supplied by the tactical commands and MAC (Military Airlift Command). MAC's major mission is overseas airlift, in support of all military services, on a global scale. Its aircraft include the largest and heaviest lifters, eventually to become an all-jet fleet. MAC will be further discussed in Chapter 5. Tactical airlift forces serve the forces of the U.S. Army and operate mainly within a theater. In a major operation such as the deployment of a CASF along with ground forces, tactical airlift and MAC work together. Tactical airlift includes the rapid air movement to distant areas of combat forces and equipment, the airlift support and resupply of the battle area, and airborne operations.

Airlift functions of TAC are divided into five categories: airborne, unit deployment, logistic airlift, special airlift, and aeromedical evacuation.

The essential elements of airborne operations are Air Force tactical airlift forces and Army airborne forces. The ability of an area commander to execute airborne operations at times and places of his choosing forces the enemy to take extensive security measures. Many enemy troops will have to be kept out of the battle because they will have to guard rear areas against airborne attack. One essential for successful airborne operations is the control of the air. All air operations must be correlated with the airborne forces so that the entire operation can be completely integrated.

Unit deployment is the movement of entire units for the purpose of being employed to best advantage throughout the area of battle in the shortest amount of time. When units are air transportable, they become more mobile, thus enhancing their normal capability.

Logistic airlift operations consist of the routine, integrated movement by air of personnel and materiel within the desired area. These operations support all elements of the area force and are normally conducted in accordance with policies established by the responsible area commander. These operations include both scheduled and nonscheduled airlift. Techniques for delivery of cargo without landing include parachute drop, free drop of certain cargo from low altitude employing strong crates and pallets able to withstand the shock of landing, and cargo extraction, by which ground equipment hooks into airborne gear to pull the cargo out of the rear hatch of a low-flying aircraft.

Special airlift missions are operations to perform special tasks, both in peacetime and in war. Examples are psychological warfare and welfare-type missions in conjunction with quasi- or nonmilitary organizations.

Aeromedical evacuation operations are those concerned with the air movement of sick and wounded personnel. Like logistic airlift, these services are provided in accordance with the policies established by the respective area commander. Within combat zones, responsibility for medical airlift is divided between the Army and Air Force. However, outside combat areas, the Air Force is responsible for all medical airlift. A member of the armed forces of the United States who has been wounded, has far better chances of survival than did his counterpart of World War II or the Korean Conflict. Aeromedical evacuation is fast and efficient, providing rapid transport for wounded soldiers.

The four-turboprop C–130 Hercules is the mainstay of the tactical airlift fleet. It combines large payload capacity and long range with the ability to get into and out of landing fields that would be extremely difficult for other aircraft of its size. Other tactical airlift aircraft are smaller and have still better short-field or STOL capability. Details are provided further on.

Tactical Air Control System

Although tactical air control is a large subject in itself and could be given lengthy treatment here, we shall set forth only a few principles that govern the operation of the Tactical Air Control System.

The system governs the performance of all five of the basic tasks described above, to insure the coordination of tactical airpower with the forces of other services in a theater. It operates in close cooperation with the Army's Tactical Support System to provide rapid exchange of battle information, coordination of Army and Air Force air defenses, and coordination of all air and ground operations.

Guidance and control of tactical air forces in the field depend on the ability of the commander or his representative to "see" the area of operations. Radar surveillance together with associated communications provide this means. As we noted above, these facilities cannot match the elaborate underground installations of NORAD and SAC headquarters, with their mammoth electronic display screen and banks of computers, or even the SAGE equipment of a NORAD divisional command post. Instead, the radar installations, communications stations, and command posts, must be highly mobile, lightweight, and able to stand up under rough field usage.

Hub of the system is the Tactical Air Control Center (TACC), which provides centralized control of the air effort in a theater of action. Control and Reporting Centers at main radar sites and Control and Reporting Posts at secondary or gap-filler radar sites feed data to the TACC. These centers and posts are prepared to take over each other's functions or those of the TACC itself should any of these installations be knocked out. Another nerve center, the Direct Air Support Center (DASC), is located alongside the Army's Tactical Operations Center, where it specializes in handling close-support requests, both preplanned and immediate. "Preplanned" usually means planned one day ahead. From the available air effort, there is usually a quota of missions remaining after the preplanned requests to take care of immediate requests, which arise in the battle situation and are unforeseen.

The forward element of the system is the Tactical Air Control Party, usually two officers (rated fighter pilots) attached to the Army at battalion level, along with several airmen to operate and maintain their vehicles and portable communications equipment. The TACP officers act as air advisers to Army unit commanders and are in a position to provide on-the-spot reporting and control of direct support air strikes. Sometimes an airborne forward air controller, flying a light observation-type aircraft, is employed for finding and directing strikes on targets. This type of mission is especially suitable in special operations, described below.

Special Operations

There is one remaining aspect of tactical air operations that we must examine—the field of special operations. Special operations include unconventional warfare, psychological warfare, and counterinsurgency. Training in special operations is necessary for developing the air tactics and hardware that will permit free world military forces to defeat the Communist in his chosen method of battle—insurgency.

Unconventional warfare is a type of warfare that includes the three interrelated fields of guerrilla warfare, evasion and escape, and subversions. Unconventional warfare operations are conducted within enemy or enemy-controlled territory mostly by native personnel who are directed by an external source.

Psychological warfare is a special type of warfare that employs propaganda and other psychological actions for the primary purpose of influencing the opinions, emotions, attitudes, and behavior of peoples and to support the achievement of national objectives of the nations involved. Psychological operations also include political, military, economic, and ideological actions. Aircraft employment in this area is mainly in dropping leaflets or broadcasting surrender appeals.

Insurgency is a condition resulting from a revolt or insurrection, short of civil war, against a constitutional government. Currently, subversive insurgency is primarily Communist inspired and supported. Counterinsurgency, therefore, consists of military, political, economic, psychological, and civic actions taken by a government to defeat the insurgent forces. While highly developed military capabilities will deter limited and general war, only enlightened government and responsible leadership can deter insurgencies. The United States provides assistance to those governments that are fighting insurgency. This U.S. assistance helps the governments provide adequate internal security while necessary social and economic measures are taken. Special operations projects can include a variety of military civic actions, such as medical aid or airlift to assist remote village dwellers.

TAC is very much involved in this type of warfare. The primary concern of TAC is to apply the flexibility of airpower to this difficult brand of war. The Air Force has a dual role in special operations, direct and indirect. The direct role is that of the tactical air forces which provide close support of counterguerrilla forces, reconnaissance, airlift, and interdiction. The indirect role is to deny air support to the insurgent forces. This is accomplished through superior tactical and strategic airpower.

While there is great emphasis put upon developing new special operations tactics, strategy, and weapons, this type of war is by no means new to the tactical air forces. Their history of participation in guerrilla and counterguerrilla activity is a record of growing credits. The air mission has advanced from simple airdrops of personnel and materials, through reconnaissance and concentrated firepower, to fast reaction in practically every operating phase of guerrilla and counterguerrilla warfare.

TACTICAL AIRCRAFT AND WEAPONS

The variety of tactical air operations described above calls for use of the widest variety of aircraft and weapons employed by any major operational command. The five basic tasks in the conduct of conventional tactical air warfare call for the use of high-performance aircraft and ability to use nuclear or heavy conventional weapons. The area of conflict just described, special air warfare, calls for performance of the same five tasks in a somewhat different way, with aircraft and weapons specially adapted to special operations requirements. The panoply of aircraft and arms employed by TAC and the overseas tactical air commands is briefly described below. Here and there some future developments or needs are noted.

Fighter and Attack Aircraft

In counterair, interdiction, and close air support roles, tactical air forces employ jet fighters (F prefix) and attack aircraft (A prefix). The distinction is that the fighter is considered capable of air-to-air combat while the attack aircraft is designed mainly for use against ground targets in what is technically called a "permissive environment," that is, conditions under which air superiority exists or has been gained and there is little danger of being engaged in combat with enemy planes. For the past several years, all "F" planes have been supersonic jets (Tactical units of the Air National Guard still fly subsonic jet fighters of Korean War fame such as the F–84 Thunderstreak and the F–86 Sabrejet). Aircraft in the "A" category include a broad range in themselves, from heavy jets of large weapon payload to reciprocating-engine aircraft especially fitted for the special operations mission. The Air Force does not consider the "A" plane to be a mere outmoded fighter. Research and development projects currently aim toward improving both "A" and "F" aircraft.

FIGHTER AIRCRAFT.—The supersonic fighters of tactical air forces include the following:

F–100 Supersabre.—The F–100 became operational in 1954 and was the first U.S. fighter aircraft capable of supersonic speeds in level flight. Later models are also used as interceptors as well as tactical fighters. The F–100's speed is rated in excess of 800 mph. It is powered by a single jet engine. Armament for this fighter consists of four 20 mm. cannon, AIM–9 missiles and/or nuclear weapons.

F–104 Starfighter.—Designed for maximum speed and climb, the F–104 operates primarily as a fighter aircraft. This plane now also has nuclear capability. In addition, it has a speed of mach 2 and can operate at ceilings near 70,000 feet. Armed with a Vulcan 20 mm-Gatling gun, this fighter is a mainstay of not only TAC, but of several allied air forces.

F–105 Thunderchief.—The F–105 (Fig. 24) has replaced many of the F–100's. This aircraft is the first fighter designed to accomplish the full tactical mission. Various models of the Thunderchief provide pinpoint bombing from very high to very low altitudes. All-weather day or night capability has been obtained in later models. The Thunderchief has a speed above 1,500 mph, a ceiling over 55,000 feet, and a range in excess of 1,500 miles. Global range

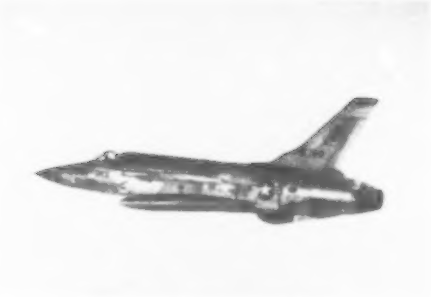

Figure 24. F–105 Thunderchief.

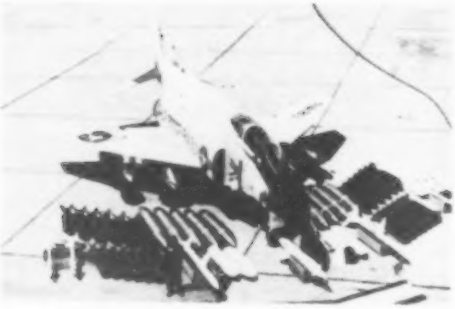

Figure 25. F–4C Phantom weapon system.

is possible through in-flight refueling. Its armament consists of the Vulcan Gatling gun, rockets, and air-to-air missiles, as well as the complete inventory of conventional weapons.

F–4C Phantom.—The current high performer of the tactical inventory is the F–4C (Fig. 25), the Air Force version of the Navy's F4B. This plane is also designed to perform all of the tactical air missions. Its operational speed is above mach 2. It has a ceiling in excess of 90,000 feet, and a range beyond 2,000 miles. The Phantom is the holder of several world's records including the world's speed record of 1,606 mph. This twin-engined craft has nuclear capability, can carry the Bullpup missile, and both the Sidewinder and Sparrow air-to-air missiles.

F–111.—The F–111, popularly known as the "swing wing" fighter, has wings that can be extended or swept back sharply while in flight. With its wings fully extended, the F–111 can take off in less than 3,000 feet, or loiter over an area for long periods of time, ready to provide full firepower whenever necessary. It can fly the Atlantic nonstop without refueling. With wings fully retracted, the F–111 becomes a delta-wing fighter that can easily exceed the speed of sound at low altitudes or fly at two and a half times the speed of sound at high altitudes. This multipurpose craft can handle all of the tactical air functions. Needless to say, the F–111 can be armed with either nuclear or nonnuclear weapons.

F–5 Freedom Fighter.—This aircraft is a multipurpose, twin-jet, supersonic fighter. Developed from the Air Force's T–38 trainer, it was initially chosen by the Department of Defense for fighter aircraft replacement in certain allied nations as part of the Military

Assistance Program. The Freedom Fighter carries over 6,000 pounds of air-to-air and air-to-surface weapons. It also has reconnaissance and surveillance capabilities. This jet is being used by the Air Force of the Republic of Vietnam. Vietnamese pilots are receiving extensive training in the F–5 in the United States.

F–15.—Currently under development is the F–15, formerly known as the FX. As the program now stands, the F–15 will be a fixed-wing, air-superiority fighter which will exceed the capabilities of the F–4C as a front-line tactical fighter.

ATTACK AIRCRAFT.—Attack aircraft include one advanced jet and several aircraft adapted to special operations missions.

A–7 Corsair.—This is a new jet attack aircraft developed for both Air Force and Navy use. Its speed is a subsonic 575 mph, but its ultrasophisticated avionics give it the ability to follow terrain in low flight and avoid detection by the enemy radar. Its other virtues as an attack aircraft are its large payload—up to 15,000 pounds of bombs, missiles and rockets, not including defensive armament—and its relatively long range. It has an unrefueled ferrying range of 3,000 miles and a combat radius of 800 miles.

Special operations attack aircraft.—Because of the peculiarities of counterinsurgency, special operations attack aircraft more closely resemble the types used in World War II and the Korean War than the latest in aeronautical advancements. New types of special operations attack aircraft are undergoing development and experimental use, but it remains important to avoid overly sophisticated or costly features in aircraft that are intended for use by the forces of technologically backward nations. Ability to operate from small, unimproved fields (STOL capability) is highly desired. So is the ability to fly "low and slow" when necessary, for greater accuracy in spotting and hitting concealed guerrilla-type targets, and "loitering" over and hitting such targets repeatedly. Typical of special air warriors are the YAT–28E, converted from the T–28 trainer, with increased speed, range, and armament payload; the old World War II medium bomber, the B–26K, remodeled with improved STOL capability; and the AC–47, the famed old "Gooney Bird," transport armed with three "miniguns," a smaller (7.62 mm.) version of the Gatling gun, each gun capable of firing 6,000 rounds per minute. It has been nicknamed "Puff the Magic Dragon." One thoroughly modern special operations aircraft is the OV–10A LARA, adaptable as an attack, reconnaissance aircraft, or general utility aircraft. It is

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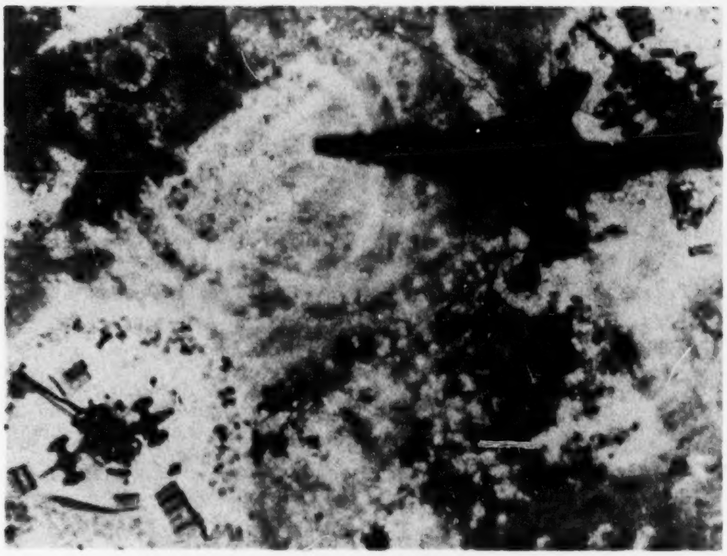

Figure 26. Low altitude picture of North Vietnamese gun emplacement taken from RF–101 Voodoo shows aircraft's own shadow.

powered by twin turboprops, is STOL capable, and has a speed of 285 mph. It can carry a varied armament payload of 2,400 pounds.

Reconnaissance and Observation Aircraft

First-line reconnaissance aircraft are adaptations of combat planes, equipped with cameras and/or electronic reconnaissance equipment rather than armament. These are indicated by the "R" prefix in combination such as RB and RF. In special operations, visual reconnaissance is emphasized ("O" for "observation" prefix).

RECONNAISSANCE AIRCRAFT.—Tactical reconnaissance aircraft include the RF–101, RB–66, and RF–4C.

RF–101 Voodoo.—The RF–101 (Fig. 26) is a supersonic photo-reconnaissance aircraft which is the first such craft ever assigned to an operational USAF unit. The Voodoo's photo reconnaissance equipment can photograph from 45,000 feet an area 217 miles long and 8 miles wide.

RB–66 Destroyer.—This aircraft is a reconnaissance model of the 600-700 mph tactical bomber, the B–66. With a three man crew, the RB–66 performs visual, photographic, electronic, and weather reconnaissance in tactical air operations, with emphasis on electronic and weather reconnaissance.

RF–4C Phantom.—The RF-4C is the first truly all-weather photoreconnaissance aircraft used for tactical air operations. It flies at much greater speeds than the RF–101 and RB–66 and has a far greater range. It is also being developed as an electronic reconnaissance aircraft.

OBSERVATION AIRCRAFT.—The aforementioned OV–10A LARA (light armed reconnaissance aircraft) is being used by both the Marines and the Air Force and can be equipped both for photoreconnaissance and visual observation. It will replace the O–1 Bird Dog, a very light two seater used for visual observation and target marking by airborne forward air controllers, especially in special operations situations.

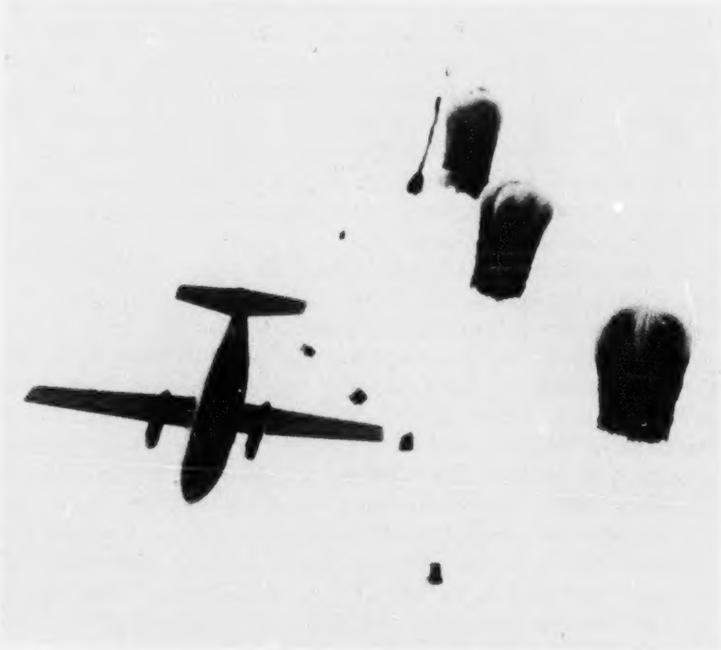

Figure 27. C–123 Provider airdropping ammunition.

Tactical Airlift Aircraft

The main airlift capacity of tactical air forces is provided by two aircraft, the C–130 Hercules and the C–123 Provider. A number of lighter transports of proven ruggedness and short-field capability add to the versatility of tactical airlift in special operations.

MAIN TACTICAL AIRLIFT.—The C–123 and the C–130 are described first.

C–123 Provider.—A twin-engined assault transport, the C–123 was designed to follow the C–119 Flying Boxcar. Although the Provider's range, speed, and capacity were similar to the C–119, it had the capability of being able to use short, unprepared landing strips. It is primarily used in forward areas to land troops and supplies and to evacuate the wounded. Its airdrop (Fig. 27) and cargo extraction capabilities, like those of the C–130, are enhanced by its upswept tail, wide rear hatch, and roller-equipped decks.

C–130 Hercules.—This four-engined turboprop transport (Fig. 28) has several advantages: (1) a maximum 20 ton load capacity; (2) quick conversion into a flying hospital; (3) high speed troop transport; (4) paratroop assault; and (5) the ability of spot-dropping by push-button control. With a cruising speed of 350 mph, ceiling above 30,000 feet, range beyond 2,000 miles, and a normal capacity for 92 troops or 36,000 pounds cargo, this long-range, high-speed air transport is the key support aircraft in TAC's Composite Air Strike Force.

OTHER TACTICAL AIRLIFT.—Perhaps the main requirement for air transport in special operations is the ability to use short, unprepared landing fields or hastily constructed landing strips. Adaptations of World War II aircraft like the C–47 "Gooney Bird," the C–46 Commando, or the B–26 (Fig. 29) have proven their worth in this situation. Newer aircraft (acquired from the Army in Army-Air Force agreement discussed in Chapter 6) are the C–7 Caribou, and the C–8 Buffalo. The Caribou can carry 32 troops or 5,000 pounds of cargo. The Buffalo has a larger capacity, but only a very few of these are available. Both meet the STOL standard—an ability to clear a 50 foot obstacle located no more than 1,500 feet from the beginning of the takeoff run, or, in landing, come over a 50 foot obstacle and come to a full stop within 1,500 feet. An aircraft still deemed to be in the experimental state although it has demonstrated its abilities successfully is the V/STOL XC–142

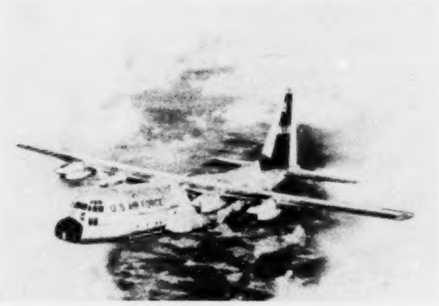

Figure 28. C–130 Hercules.

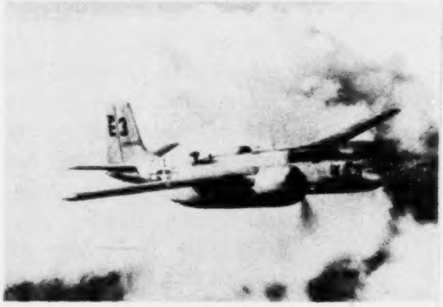

Figure 29. B–26 WWII bomber type used as tactical transport.

transport. It has four turboprop engines mounted on tilting wings. It can take off vertically with wings and engines turned straight upward, do short takeoffs and landings with wings and engines turned upward obliquely, or cruise at 285 mph with maximum speed of 430 mph with wings in horizontal position. It has a STOL payload of 12,000 pounds or can lift 8,000 pounds in vertical takeoff.

Weapons and Armament

Tactical air forces are provided with one nuclear surface-to-surface missile. Their main firepower is carried by the fighter and attack aircraft described above, a devastating variety of guns, bombs, and air-to-surface and air-to-air rockets and missiles (see again Figure 25).

THE MACE MISSILE.—The CGM–13B Mace is winged, air breathing, and subsonic in speed (about 650 mph). It has range of up to 1,200 miles. Its warhead can be either conventional or nuclear. It is deployed in fixed, hardened sites in Europe and Okinawa, where it stands ready for use against preselected targets. It has an inertial guidance system.

AIRCRAFT WEAPONS.—Fighters and attack aircraft carry a full range of air-to-ground and air-to-air weapons. Worthy of special mention are such weapons as the M–61 multibarreled Vulcan cannon or "Gatling gun," which can fire up to 6,000 20 mm. rounds per minute to solve the problem of delivering an intense concentration of gunfire from a supersonic vehicle. Air-dropped weapons include nuclear and high explosive bombs, incendijel, and canisters that release clusters of small bombs. The main air-to-air and air-to-surface missiles are as follows:

AIM–9D Sidewinder.—Previously mentioned in Chapter 3, the Sidewinder is an air-to-air weapon that is attracted toward heat and homes on the tailpipe of an enemy jet. It can be carried by all tactical fighter aircraft.

AGM–12B, D Bullpup.—This is an air-to-surface weapon with a conventional warhead, propelled by a solid-fuel rocket motor at a speed of 1,400 mph. It has a command guidance system which permits the pilot to guide it toward its target after launch. (A television-guided missile called the Walleye is under development as a replacement for the Bullpup).

AIM–7D Sparrow.—This is an air-to-air missile with a high-explosive warhead. It has a semiactive guidance system, which permits it to home on the radar of enemy aircraft. It has somewhat the same capabilities as certain members of the Falcon family, described in Chapter 3.

AGN–45A Shrike.—This is a new weapon, at latest report just about to become operational. It is a high-explosive air-to-surface missile with a radar-homing guidance system, and thus is a specialist in attacking enemy ground radar sites.

SUMMARY

Together, the Tactical Air Command and the overseas air commands form a tremendous outlay of military aerospace strength informally known as "tactical air forces worldwide." These are classed as "general purpose forces," capable of combat operations at all levels of conflict. They operate together with Army and Navy forces within the framework of unified commands. Combat-ready units of TAC, together with combat-ready units of the Continental Army Command form the Strike Command, based in the United States and serving as a provider of forces to overseas unified commands as well as having direct responsibility for taking action if necessary in the Middle East-Africa-Southern Asia area (MEAFSA). The principal air commands within the overseas air commands are the United States Air Forces in Europe, and the Pacific Air Forces. The latter includes the Seventh Air Force in the Southeast Asia-Vietnam theater.

TAC operates training schools and builds units until they are trained and equipped to combat-ready status. The majority of its schools and units are divided between two numbered air forces, but it has several separate doctrinal and technical centers outside these air forces, such as the Air Ground Operations School, the Tactical Air Reconnaissance Center, the Special Operations Force, the Tactical Air Warfare Center, the Tactical Airlift Center, and the Tactical Fighter Weapons Center. Another numbered air force is a command element which specialized in building and taking temporary command of composite air strike forces.

Tactical air personnel and equipment are usually deployed overseas as individuals or units, but an important aspect of tactical air operation is that of maintaining the ability to put together and deploy the composite air strike force, a balanced force capable of throwing its might into a local action anywhere in the world on very short notice.

The five basic combat tasks of tactical air forces are (1) air superiority, (2) interdiction, (3) close air support, (4) tactical reconnaissance, and (5) tactical airlift. The first three of these, which might be called the firepower tasks, have been recognized as being important in the order stated since World War II times.

To gain air superiority, it is best to strike first at enemy air bases and missile sites and associated radar and communications sites—destroy enemy aerospace power on the ground. The air superiority battle can also include air-to-air combat with airborne enemy planes. Performance of the other tasks is easier if air superiority is gained first.

Interdiction means striking behind enemy lines to cut lines of troop reinforcement, supply and communications. Roads, railroads and bridges are likely targets. Such missions fit into a planned program which takes time to bring results; they are not conducted on the immediate request of ground commanders.

The object of close air support is to assist ground forces in the immediate battle area by delivering aerial firepower against surface positions. It is best employed in a moving rather than static situation.

Tactical air reconnaissance makes use of airborne photographic and electronic equipment to report activity and installations behind enemy lines. Thus it serves all of the other tasks by providing the information on which to act.

Tactical airlift (distinguished from the global airlift function of MAC discussed in Chapter 5) includes the rapid air movement to distant areas of combat forces and equipment, the airlift support and resupply of the battle area, airborne troop carrying operations, and aeromedical evacuation.

A system of ground-based communications interconnecting radar sites and command posts at different levels is known as the Tactical Air Control System. Equipment is light, rugged, and portable. The Tactical Air Control Center is the hub of the system. The Direct Air Support Center specializes in handling close air support requests from the Army, and the Tactical Air Control Party, at battalion level, provides on the spot reporting and close control. Included in the latter is the forward air controller, who is usually airborne in a light aircraft in special operations.

Special operations call for the performance of the above five basic tasks in a somewhat different manner, related to unconventional warfare, psychological warfare, and counterinsurgency. Special operations projects can also include medical, airlift and other aid to civil populations.

All the above activities make tactical commands the most diversified commands in the Air Force and call for the most diversified families of aircraft and weapons. Included are supersonic fighters of high sophistication and heavy nuclear and nonnuclear firepower; subsonic attack aircraft of varying payload and firepower, including heavy attack planes, the latest STOL designs and revamped World War II models used in special operations; supersonic reconnaissance aircraft converted from fighters, with sophisticated photo and electronic gear; light observation planes carrying airborne forward air controllers; and a range of tactical airlift aircraft from the C–130 Hercules turboprop and C–123 Provider to new and old light transports of STOL capability. The weapons of the combat aircraft are similarly diversified—rapid fire machine guns and cannons; airdropped bombs, incendijel, and canisters; and air-to-air and air-to-ground missiles with varied guidance systems.

REVIEW QUESTIONS

1. **Is the Tactical Air Command mainly a providing or an employing command?**
2. **What kind of command is AFSTRIKE? MACV?**
3. **Name four methods of deploying forces overseas. Which is the largest of these deployments?**
4. **Of the five basic combat tasks of tactical air forces, which has first priority?**
5. **When is close air support most effective?**
6. **Compare the Tactical Air Control System with the direction and control system of NORAD.**
7. **What activities are included as special operations?**
8. **What are the main differences between a fighter (F prefix) and an attack (A prefix) aircraft?**
9. **What are the capabilities of the XC-142 aircraft?**

THINGS TO DO

1. Military civic actions are an important function of the Special Operations Force in achieving our national objectives, not only in Vietnam but wherever friendly nations are in need of assistance. Look for articles relating to civic action projects in Vietnam or elsewhere and make a report to your class. Current issues of *The Airman* will be a good source for this material.
2. Watch for news stories on the present status of the F-15 development program and report on what you find.

SUGGESTIONS FOR FURTHER READING

Coombs, Charles. *Aerospace Power*. New York: William Morrow and Co., 1966.

Goodie, Maj. Clifford B. *Strategic Air Command*. New York: Simon and Schuster, 1965.

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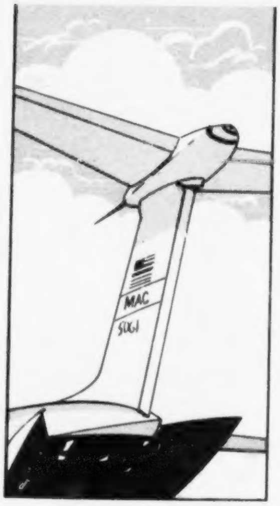
Chapter 5



Support of Aerospace Forces

THIS CHAPTER describes the Air Force support commands and agencies and explains their missions and functions. The main emphasis in this chapter is on the airlift activities and technical services of the Military Airlift Command (MAC), but there are descriptions of the other support services, including: research and development, education and training, communications, security, headquarters, reserve forces, charting and information, and accounting and finance. When you have studied this chapter, you should be able to do the following: (1) trace the development of MAC and tell how this command is organized; (2) describe MAC's airlift activities and the aircraft used; (3) identify MAC technical services and discuss the functions of each service; and (4) name the other Air Force support commands and agencies and explain their functions.

EVERY MILITARY force requires a vast and complex system of supply and technology to keep it capable of operation. The United States Air Force is no exception. Its support forces must supply the Air Force with airlift, research and development, logistics, education and training, and an endless variety of other kinds of assistance. In order to fulfill these support roles, the Air Force has established seven support commands and seven separate operating agencies. As supporting elements of our aerospace forces, these commands and agencies provide the following: supplies, weapon systems, support systems, maintenance, combat materiel, surface transportation, personnel, administration, training, communications, advanced education, and special services.

The Chief of Staff, USAF, is directly responsible for these commands. He assures that personnel are trained, organized, and equipped so that they can provide the proper support to all other commands. The major Air Force supporting commands are:

Air Force Communications Service (AFCS)
Air Force Logistics Command (AFLC)
Air Force Systems Command (AFSC)
Air Training Command (ATC)
Air University (AU)
Headquarters Command (HQCOMD)
United States Air Force Security Service (USAFSS)

Discussed first in this chapter is the Military Airlift Command (MAC). It is not found in the above list, because it is considered an *operating* command, like SAC, TAC, or ADC, rather than a support command. Both in its airlift and technical services, however, MAC supports both the Air Force and other military services.

Seven separate operating agencies also perform specialized support functions which are necessary to the Air Force. These supporting agencies are:

Air Force Accounting and Finance Center (AFAFC)
Aeronautical Chart and Information Center (ACIC)
Office of Aerospace Research (OAR)
United States Air Force Academy (USAFA)
Air Force Data Systems Design Center (AFDSDC)
Headquarters Air Force Reserve (AFRES)
Air Reserve Personnel Center (ARPC)

Since these agencies perform specialized functions, they come under the command of Headquarters, U.S. Air Force. The functions these agencies perform do not fit into the missions of any major command, but each agency contributes to the overall mission of the Air Force.

This chapter will examine the mission of these various support commands and agencies to show their relationship to the combat posture of the United States Air Force.

MILITARY AIRLIFT COMMAND (MAC)

Military Airlift Command (MAC) provides air transportation of personnel and cargo for all the military services on a worldwide basis. It is a major command of the Air Force but includes naval personnel. In addition to its main airlift function, MAC furnishes weather, rescue, and photographic and charting services for the Air Force.

Comparison of MAC and TAC Airlift

The global airlift service of MAC should be distinguished from tactical airlift as described in the preceding chapter. As a rule, MAC provides transoceanic airlift from the United States into overseas areas, or within overseas areas, in peace and war; while tactical airlift operates within a theater of action such as Vietnam, from port of debarkation to battlefront, and otherwise spends its time in training and maneuvers to prepare for combat airlift tasks, not performing any day-to-day support functions. This distinction, however, should not be considered cut and dried. MAC crews too are trained for such tactical-type operations as air dropping and air landing of troops and supplies in forward areas. It is not practical at the present time to airlift an entire Army division—men, vehicles, weapons, and equipment—from the interior of the United States directly into an overseas battle zone. Such an operation is envisioned in planning and training programs for the future. Meanwhile MAC and TAC airlift forces are learning to work as a team, joining together in Strike Command and CASF deployment maneuvers including both global and local airlifts and paratroop and cargo drops.

It has always been MAC policy to reserve some of its own aircraft for these and other special military missions while farming out part of its day-to-day cargo and passenger mission to commercial airlines under MAC contract.

History

The Military Airlift Command acquired its present name 1 January 1966, but it had a long prior history of global airlift and technical missions under other names. It began in World War II as the Ferrying Command. Ferrying means transporting aircraft under their own power, not necessarily with cargo and passengers. During the early months of U.S. participation in World War II, this means of delivering much needed airpower across seas infested with enemy submarines was paramount. In mid-1942, the command became the Air Transport Command (ATC) and added the airlift mission and that of developing overseas air routes, bases and facilities.

Soon ATC was in the global airlift business in a big way, with routes to Alaska; direct to England by way of the North Atlantic; roundabout to England by way of Brazil and the South Atlantic; and across Africa, the Middle East, and India, and ultimately to China. The Navy established a similar service across the Pacific. These routes were flown by two-engined C–47's and C–46's, and four-engined C–54's and C–87's. The C–87 was a converted Liberator bomber; the other three were adapted from commercial passenger plane designs. The most dramatic ATC exploit was known as "The Hump"––a steady airlift over a 500-mile route from eastern India into China over Japanese-ocuppied areas of Burma and China. The hazards of the Hump included high Himalayan mountain peaks, wild jungle terrain in the valleys between, heavy monsoon weather, and—when the weather cleared—Japanese fighters.

When the war ended, ATC continued to maintain its global routes on a reduced scale. In 1948, the newly-created U.S. Air Force consolidated ATC and naval and other Air Force elements into a new command, the Military Air Transport Service (MATS). This was the name under which the command traveled from 1948 through 1965. Hardly had MATS been created when a European crisis brought on the effort called the Berlin Airlift (described in Chapter 1). The airlift itself was conducted by USAFE and allied air forces, but MATS helped get it started by rushing in men and aircraft to augment it, and then maintained a supporting transatlantic airlift. A few months' breathing spell after the Berlin Airlift was followed by the outbreak of hostilities in Korea in June, 1950, which stepped up traffic across the Pacific. MATS has been continuously busy since then, maintaining steady passenger and supply routes to globally-deployed U.S. military forces as well as moving in with force in emergencies demanding major airlift efforts. From Antarctica to Thule, Lebanon to Taiwan, the Congo to Vietnam, the dramatic exploits of MATS and MAC have been written in history.

The MAC technical services have had a fascinating history of their own. There has been a considerable amount of reshuffling—moving organizations into and out of the command. For instance, the Air Force Communications Service, now a major command, was a part of MATS until 1961. Originally the emphasis of the MATS services was on route and flight service in support of the main airlift mission. As a motorist uses road maps, signs, and markers to guide him along the highways, so a pilot uses charts, communications, and weather information to guide him over the airways. Today these services are still essential, but some have been transferred out of MAC, and those that remain in MAC include many Air Force-wide and military services-wide support functions, including tasks in support of the Nation's nuclear, space, and other scientific projects.

MAC Airlift

The whole complex of MAC activities is conducted from headquarters at Scott AFB, Illinois. Let us consider the main airlift function first, then the technical services.

ORGANIZATIONS.—MAC's major airlift effort is conducted through two numbered air forces shown in the top deck of the organizational chart (Fig. 30). The 21st, with headquarters at McGuire Air Force Base, New Jersey and flying out of other bases in the eastern United States, conducts airlift operations throughout the North Atlantic, Europe, Africa, and South America (Fig. 31). The 22nd, with headquarters at Travis Air Force Base, California, conducts vast airlift operations in the Pacific and Far East (Fig. 32). The Mississippi River is the dividing line between these two air forces' areas of responsibility in the United States. On the other side of the globe, these areas meet again at the 90th meridian east, near Calcutta, India.

Special airlift organizations (shown in the second deck of Figure 30), include a training wing, a "special missions" wing, and a wing conducting domestic aeromedical service. The special missions wing flies the famed Air Force One presidential plane (a 707 commercial

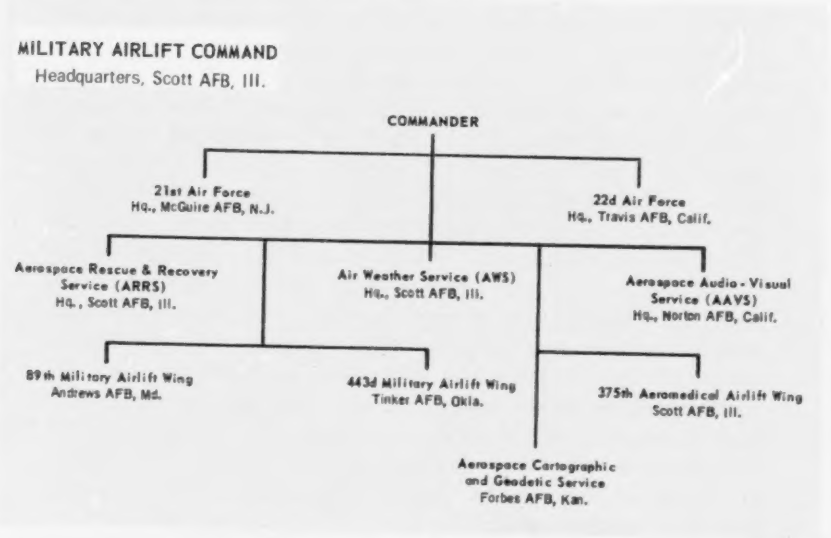

MILITARY AIRLIFT COMMAND
Headquarters, Scott AFB, Ill.
COMMANDER
21st Air Force
Hq., McGuire AFB, N.J.
22d Air Force
Hq., Travis AFB, Calif.
Aerospace Rescue & Recovery Service (ARRS)
Hq., Scott AFB, Ill.
Air Weather Service (AWS)
Hq., Scott AFB, Ill.
Aerospace Audio-Visual Service (AAVS)
Hq., Norton AFB, Calif.
89th Military Airlift Wing
Andrews AFB, Md.
443d Military Airlift Wing
Tinker AFB, Okla.
375th Aeromedical Airlift Wing
Scott AFB, Ill.
Aerospace Cartographic and Geodetic Service
Forbes AFB, Kan.

Figure 30. Military Airlift Command organization.

liner type designated VC–137) and other specially appointed passenger-type aircraft used for transporting high Government officials, foreign heads of state, and other VIP's. The domestic aeromedical service flies C–131, C–118, and C–9 hospital aircraft carrying sick and wounded patients of all military services to and between military hospitals throughout the United States. This service connects with that of transoceanic jet hospital planes (C–135's and C–141's) flown by the 21st and 22nd Air Forces to form the last link in an aeromedical evacuation chain by which a sick or wounded serviceman anywhere in the world—whether at a battlefield in Vietnam or a remote station in Greenland or Africa—is no more than a day or two from complete medical attention in a stateside hospital if such treatment is deemed necessary.

The third deck of Figure 30, showing the technical services, is discussed later. Meanwhile a few more facts about the operations and aircraft of the airlift service are of interest.

OPERATIONS.—MAC provides airlift between area commands; between the United States and overseas areas; and within an area command. Ability to perform tactical functions such as the landing or dropping of troops, equipment, and supplies into combat zones

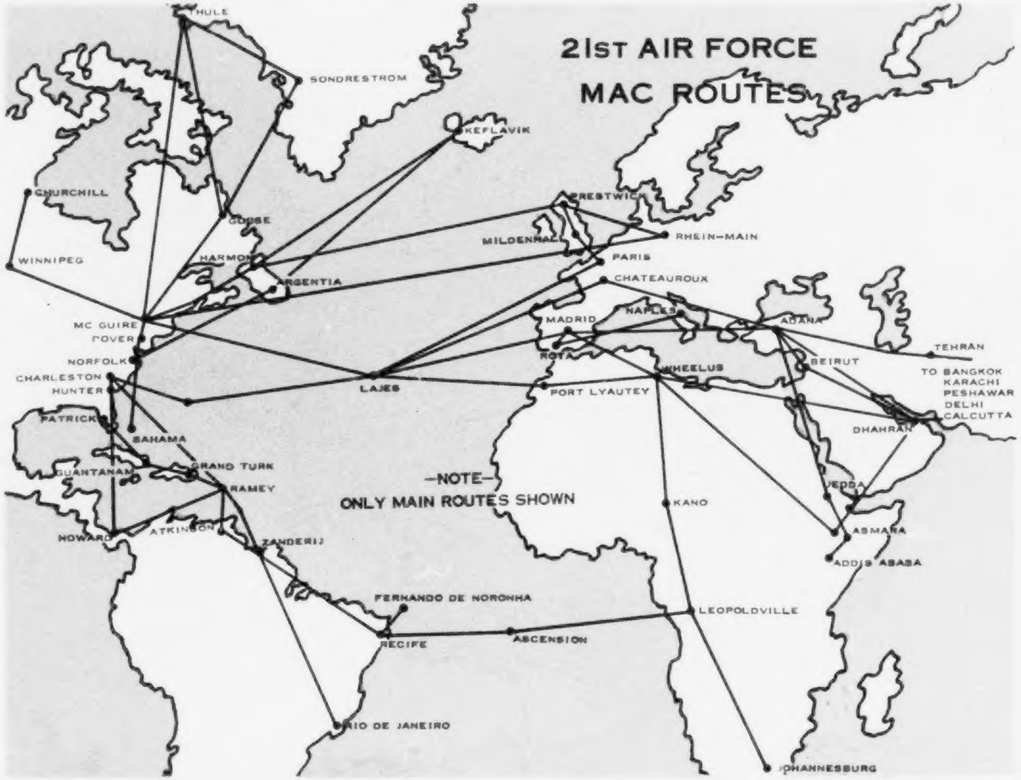

21ST AIR FORCE
MAC ROUTES
THULE
SONDRESTROM
KEFLAVIK
CHURCHILL
GOOSE
WINNIPEG
HARMON
ARGENTIA
PRESTWICK
MILDENHALL
RHEIN-MAIN
PARIS
CHATEAUROUX
MADRID
NAPLES
ADANA
TEHRAN
MC GUIRE
DOVER
NORFOLK
CHARLESTON
HUNTER
ROTA
LAJES
PORT LYAUTEY
WHEELUS
BEIRUT
TO BANGKOK
KARACHI
PESHAWAR
DELHI
CALCUTTA
PATRICK
BAHAMA
DHAHRAN
GRAND TURK
GUANTANAMO
RAMEY
-NOTE-
ONLY MAIN ROUTES SHOWN
JEDDA
KANO
HOWARD
ATKINSON
ZANDERIJ
ASMARA
ADDIS ABABA
FERNANDO DE NORONHA
LEOPOLDVILLE
RECIFE
ASCENSION
RIO DE JANEIRO
JOHANNESBURG

Figure 31. 21st AFMAC routes.

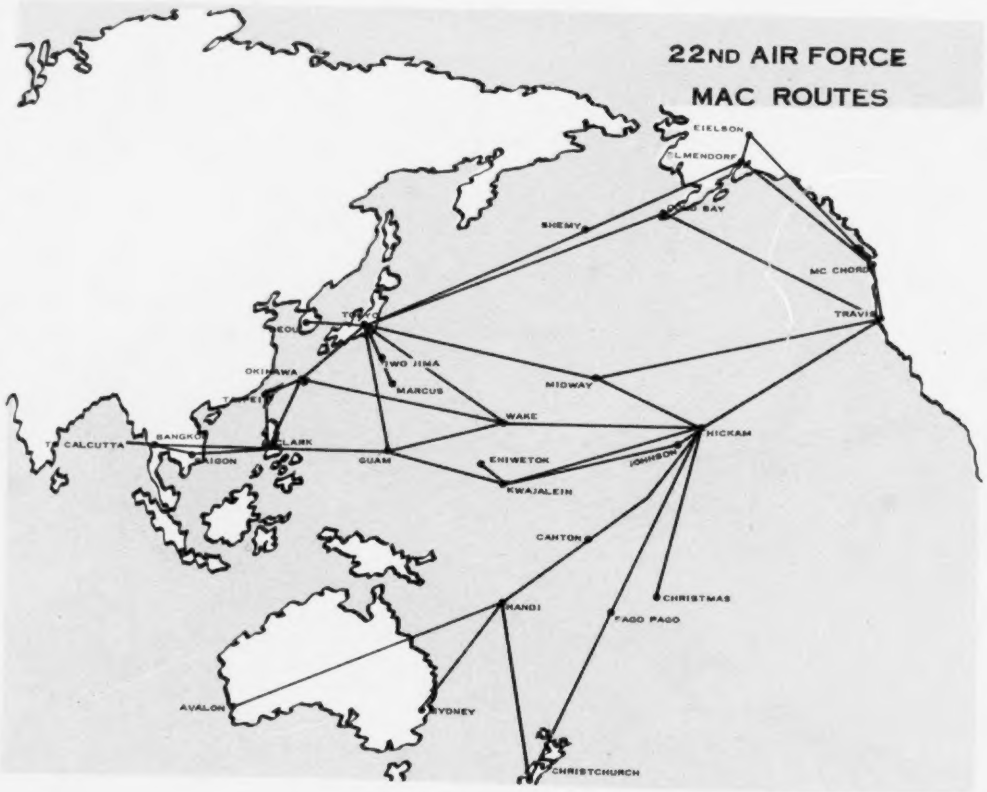

22ND AIR FORCE
MAC ROUTES
EIELSON
ELMENDORF
OLD BAY
SHEMY
MC CHORD
TRAVIS
SEOUL
OKINAWA
IWO JIMA
MARCUS
MIDWAY
WAKE
HICKAM
TAIPEI
CALCUTTA
BANGKOK
SAIGON
CLARK
GUAM
ENIWETOK
JOHNSON
KWAJALEIN
CANTON
CHRISTMAS
NANDI
PAGO PAGO
AVALON
SYDNEY
CHRISTCHURCH

Figure 32. 22nd AF/MAC routes.

is written into the command mission. Its task is to maintain in a constant state of readiness an airlift force for the Department of Defense and the Government to use in a variety of routine, special, or extraordinary missions and exercises. Its regular airlift forces are augmented by commercial airlines, organized in the Civil Reserve Airlift Fleet (CRAF), and by Air Force Reserve airlift units. Besides carrying part of the day-to-day burden of military air traffic, commercial airlines of the CRAF also have aircraft earmarked for emergency use under MAC control, if the occasion should ever arise when a massive total national airlift capability should be required. The current conflict in Vietnam has required an extra measure of activity by MAC, commercial, and Reserve units—the last calling up aircrews from their civilian pursuits from time to time to perform overseas flights. The latest figures available at this writing show that total MAC and MAC-procured air traffic increased from 6.4 billion ton-nautical miles during the year 1967 to almost 7.5 billion ton-nautical miles in 1968.

An intricate command and control system, stemming from MAC and its 21st and 22nd Air Force headquarters, knows the location of every MAC aircraft worldwide and can divert any plane into a new mission when necessary on instant notice.

AIRCRAFT.—The regular MAC fleet consisted of 525 aircraft at the end of 1967 and 483 aircraft at the end of 1968. Although the number of aircraft decreases, the total ton-mile capacity increases because of steady replacement of older propeller-driven types with larger and faster jets. Most of the older aircraft, however,

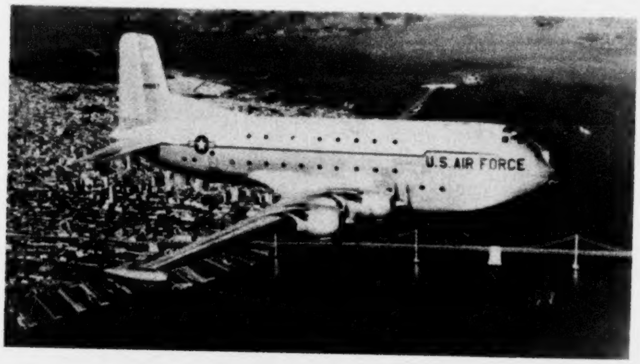


Figure 33. C–124 Globemaster.

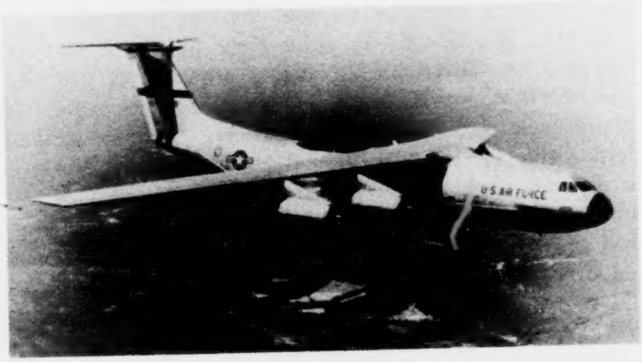


Figure 34. C–141 Starlifter.

have not been retired from service but have continued to serve MAC and TAC in Reserve and ANG air transport units.

C–124 Globemaster.—Of the older MAC airlifters, the C–124 deserves special mention (Fig. 33). As of mid-1967 it was still barely the most numerous type in MAC (193 planes) but was about to fall behind the growing C–141 force (188 planes). Long the mainstay of the MATS-MAC airlift effort, the Globemaster was designed completely as a military airlifter and introduced into the MATS fleet in 1951. It has seen service in every major airlift since Korea. It is equipped with huge clamshell doors in front to facilitate loading and unloading and permit vehicles to be driven aboard. It can carry 25 tons of cargo 2,300 miles, or carry 200 fully equipped troops. It is powered by four 3,800 hp piston engines and has a cruising speed of 230 mph.

C–141 Starlifter.—Soon to outnumber the C–124 and greatly increase the MAC airlift capacity is the C–141 all-jet (turbofan) Starlifter (Fig. 34). This high-wing low-fuselage aircraft, with truckbed-height rear loading, cruises at over 500 mph and can carry 30 tons of cargo nonstop 4,600 miles. Its cubic capacity is no larger than that of the Globemaster, but its greater range/payload factors, and speed add up to greatly increased carrying power for a given number of aircraft. The C–141 carries 154 troops or 80 litter patients.

Other MAC airlift aircraft.—The C–118 Liftmaster, a four-engine troop and cargo aircraft, and the C–131 Samaritan, a two-engine aircraft, formerly made up the domestic and European aero-

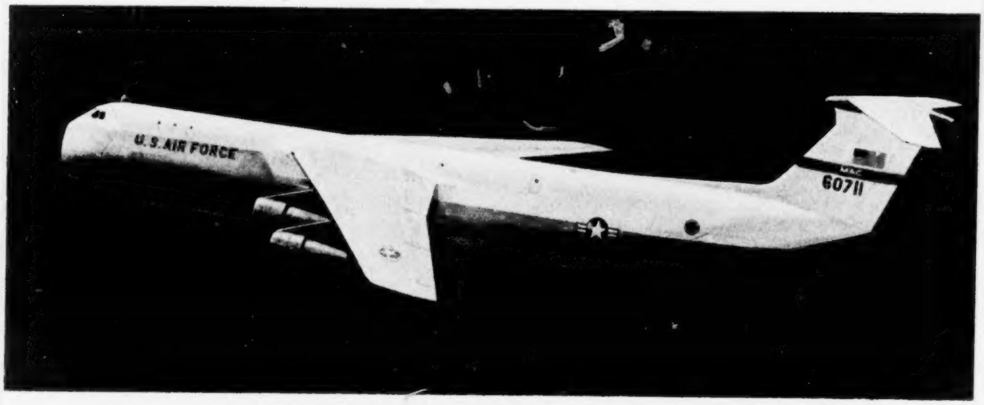


Figure 35. C–5 Heavy logistic transport.

medical fleets. These older reciprocal types are being replaced in this mission by the C–9 Nightingale, a twin-jet, medium transport. The four-turboprop C–133 Cargomaster is still the largest aircraft in MAC. It once set a world record by lifting 59 tons to a height of 10,000 feet. It can cruise at nearly 300 mph. It is a specialist for hauling entire missiles or other large cargo items. The Boeing C–135 Stratolifter, a version of the KC–135 of SAC has all but completed its role of serving as an interim large jet airlifter while the C–141 fleet was abuilding. Most of the C–130E Hercules turboprop aircraft in the MAC fleet have now been transferred to tactical air forces. (The E model has wing tanks to give extra range).

The C–141 will be dwarfed by the new C–5A (Fig. 35) scheduled to become operational after completion of testing which began in mid-1969. This giant jet will have about three times the capacity of the C–141. It will be able to haul the heaviest artillery pieces of an Army division and will feature both front and rear loading, with drive-through capability of large vehicles two abreast. Like the C–141, it will be able to use airports with runways of 6,000 feet or less. The MAC fleet of the near future, will be a combined C–5A and C–141 fleet.

MAC Technical Services

The technical services performed by MAC for both the Air Force and other Government services are the task of four subordinate organizations: the Aerospace Rescue and Recovery Service (ARRS), the Air Weather Service (AWS), the Aerospace Audio-Visual Service (AAVS), and the Aerospace Cartographic and Geodetic Service.

AEROSPACE RESCUE AND RECOVERY SERVICE (ARRS).—Scott Air Force Base, Illinois, is the headquarters for this technical service. ARRS employs its forces on a worldwide basis, operating from 96 locations in 21 countries. The Aerospace Rescue and Recovery Service has 4,500 people whose mission is to provide recovery service to the Air Force and all other military and civilian activities.

Within the continental United States, the ARRS is responsible for the direction and control of all inland search and rescue operations. In this capacity it functions as director of search efforts of such units as the Civil Air Patrol, National Guard, the Navy, Coast Guard, and all local law enforcement agencies.

ARRS also provides aircrew recovery for all incidents involving Air Force aircraft. This task involves locating, rendering aid to, and retrieving aircrew personnel from friendly or hostile lands in peace or war. For these reasons, the ARRS must maintain its forces and facilities in a constant state of readiness.

In addition to aiding civil aviation upon request, this rescue force assists military and civil organization of foreign countries in accordance with the procedures established by the International Civil Aviation Organization and with the policies of the Department of Defense.

ARRS has also moved into the space age. One of its tasks, in support of NASA, is to fly specially fitted Hercules aircraft (HC-130), equipped with tackle for midair capture of capsules ejected from satellites as they parachute down from space. Rescue of astronauts after they have splashed down at sea is a well-known ARRS mission. This means recovery both within and outside programmed recovery areas. The unscheduled Pacific splashdown of Gemini 8 in March 1966 was followed by prompt rescue and recovery by ARRS, an outstanding example of the service's capability.

Other aircraft flown by ARRS crews include the only amphibian airplane currently flown by the Air Force (the HU-16 Albatross). The most important remaining Air Force helicopter operations since the Army Air Force agreement of 1966 (see Chapter 6) are ARRS operations. The HH-3C "Jolly Green Giant" is a large helicopter, with a 5,000 pound payload, which has won fame in rescuing downed flyers in Vietnam.

Air Weather Service (aws).—The largest of the MAC technical services has its headquarters at Scott Air Force Base, Illinois, from which it controls a force of over 11,000 personnel stationed in more than 400 locations the world over. Its mission is to provide specialized weather service to the Air Force and Army as well as U.S. and foreign civil weather bureaus.

The unit, *Weather*, one of the booklets in AE-I of the Junior AFROTC curriculum, contains some description of AWS's routine and basic observing and forecasting functions mainly in support of Air Force flying. Other AWS activities include operation of eight aerial sampling and weather reconnaissance units throughout the world. In support of scientific projects, AWS conducts both balloon and rocket soundings of the upper atmosphere. Data gathering and analyzing equipment available to AWS include Tiros satellites, which take pictures of cloud patterns over large areas of the world and transmit them to ground stations for analysis and forecast purposes, computers for analyzing masses of global weather data or past weather history, radar, and instruments for instant recording and transmission of weather information.

AWS has detachments stationed at all Air Force bases and operates other fixed or mobile ground stations at selected observation points. The detachments are organized in larger units such as squadrons, groups and wings. The units in the United States are not set up by geographical areas but are organized according to the commands they support, whether in a few localities or nation wide. In this way, weather service can be specialized or tailor-made according to the needs of the command. Each of the major air commands discussed so far in this text—SAC, ADC, TAC, area commands, support commands and MAC itself—needs a different kind of weather service. It may call for a computer-equipped central forecasting facility for analyzing the continental or global weather picture for SAC. It may call for development of mobile observing units and rapid transmission of up-to-the-minute local weather for tactical operations; or it may call for special scientific projects in support of research conducted by the Systems Command or the Office of Aerospace Research. Thus AWS serves the whole Air Force as well as other Government agencies and has a variety of specialized branches for this purpose.

Aircraft flown by AWS include the Hercules in another adaptation, the WC-130. The main weather reconnaissance function is now carried out by a former SAC bomber, the WB–47, a six-engine jet which flies at high altitudes and makes observations by means of dropsondes—instruments which descend to earth by parachute and transmit weather information from different altitudes on their way down.

AEROSPACE AUDIO-VISUAL SERVICE (AAVS).—The only non-flying service within MAC is the Aerospace Audio-Visual Service (AAVS). This service operates at worldwide locations to provide centralized management and programming of all Air Force photo and motion pictures. AAVS also provides film coverage of all missile launches, including manned launches. It documents all nuclear tests and joint training exercises and provides all Air Force training and orientation films. To summarize, AAVS provides the Air Force and Department of Defense with worldwide photographic services.

As examples of the AAVS mission, we have the following: The 600th Photo Squadron, Tan Son Nhut Air Base, South Vietnam, provides "over-the-target" photography with both still and motion cameras. Also, AAVS provides photographic support to the Air Force missile and space programs. It further aids tests sponsored by the Atomic Energy Commission and NASA. A fourth task is to maintain film depositories for all Air Force film that is to be retained for future use.

AEROSPACE CARTOGRAPHIC AND GEODETIC SERVICE (ACGS).—The Aerospace Cartographic and Geodetic Service is located at Forbes Air Force Base, Kansas, and has detachments deployed to many remote areas of the world, where they perform highly specialized and technical cartographic and geodetic tasks for the Department of Defense. These include precise aerial mapping photography, electronically controlled aerial mapping photography, aerial electronic geodetic surveys, ground geodetic surveys, and related activities. Under terms of special agreement, photo and electronic surveys have been carried out in foreign countries around the globe. Geodetic services vary from precise positioning of missile sites to intercontinental ties using aerial electronic survey systems. The ever-versatile Hercules, as the RC–130, performs the mapping mission. Various aircraft and helicopters are used for resupply of remote sites.

RESEARCH AND DEVELOPMENT—OAR AND AFSC

As a leading world power, massive in strength and responsibility, the United States must maintain and constantly improve its military technology. In this effort, the Nation has numerous resources from which it can draw. It has great industries, rich natural resources, and, above all, human resources. American scientists, technologists, industrialists, and engineers have superior creativity, funds of technical knowledge, and skills. There are excellent research facilities located throughout the country at universities, at research institutes, in industry, in nonprofit organizations, and in the military services. To marshal these many resources on behalf of the Air Force, the Air Force has two organizations. One is a major command, the Air Force Systems Command (AFSC). The other is an agency, the Office of Aerospace Research (OAR), smaller than AFSC but independent of it, also reporting directly to the Chief of Staff.

Formerly both these organizations were part of one command, the Air Research and Development Command (ARDC). A reorganization in 1961 abolished ARDC and created AFSC and OAR. To understand this division, one must understand what the word "systems" means in the AFSC title. We have met some of these systems in preceding chapters. A fighter aircraft together with all its weapons and electronic communications, navigation, and fire-control equipment, is an aircraft weapon system. A C–141 Starlifter, together with all its avionics and instruments plus cargo-handling equipment on board the plane and on the ground, is another kind of aircraft system. No one part of such a system can be designed without consideration of the other parts. If different experts at different companies are engaged in developing a new aircraft system, their efforts must be coordinated. There are, of course, not only aircraft systems but ground systems. SAGE, described in Chapter 3, is an example. Even an administrative office can be an example. If a computer can lighten its burdens, it must be designed and developed as part of a management system. Just about anything in the way of modern technologically advanced equipment must be developed as part of a complex system, not as a thing apart. AFSC is the command charged with bringing new systems into the Air Force—conducting and managing its own and others' efforts in research, development, and procurement. The bulk of this section deals with AFSC, but first let us take a brief view of OAR.

The Office of Aerospace Research (OAR)

Scientific progress, even that which benefits military technology, cannot be entirely harnessed to systems development. There must be basic research, exploring in many directions, some of it fruitful, some not. OAR is the agency responsible for planning programming, and managing the varied activities of the USAF Research Program. Its headquarters are in Washington, D.C. and its major laboratories and offices are the Air Force Cambridge Research Laboratories at L.G. Hanscom Field, Bedford Massachusetts; the Aerospace Research Laboratories at Wright-Patterson Air Force Base, Ohio; and the Air Force Office of Scientific Research in Washington, D.C. There are also several smaller OAR laboratories and field offices throughout the country, and much of the research is performed through contracts and grants in college, university, and industrial laboratories.

The broad areas in which research is done include terrestrial, atmospheric, astronomy-astrophysics, biological, and medical sciences; behavioral and social sciences; general and nuclear physics; chemistry; mathematics, electronics; materials; mechanics; and energy conversion. Findings are made available to Government agencies and the civilian scientific community. OAR provides a high-latitude research launch capability at Fort Churchill, Canada, for research by DOD, NASA, and Canadian agencies. In conjunction with AFSC, OAR approves, programs, and allocates payload space on sounding rockets, deep space probes, and satellite vehicles.

Air Force Systems Command (AFSC)

With headquarters at Andrews Air Force Base, Maryland, and installations and offices throughout the country and abroad, the Air Force Systems Command provides the management and direction needed in conducting research and in producing, testing, and acquiring weapon systems for the Air Force. Also, AFSC carries out special missions assigned to it by the Department of Defense for other military services and for the National Aeronautical and Space Administration (NASA). The Air Force fulfills its assignments as a prime space agency and teams with NASA primarily through its Systems Command.

Under Headquarters AFSC are six divisions, five test and development centers, and a special space and missile organization that perform assigned responsibilities and technical functions (Fig. 36). From the brief descriptions of these which follow, one can get a sense of the scope of AFSC activities.

SPACE AND MISSILE SYSTEMS ORGANIZATION (SAMSO).—The Space and Missile Systems Organization, with headquarters at Los

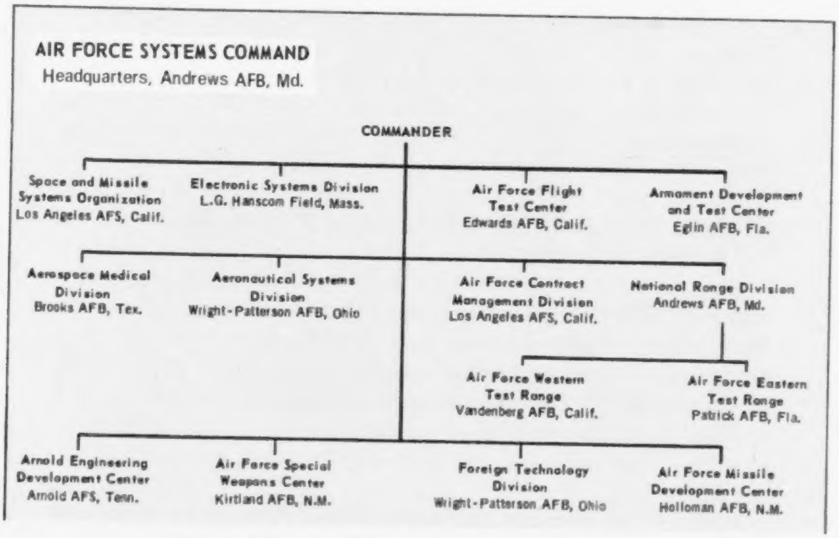

AIR FORCE SYSTEMS COMMAND
Headquarters, Andrews AFB, Md.
COMMANDER
Space and Missile Systems Organization Los Angeles AFS, Calif.
Electronic Systems Division L.G. Hanscom Field, Mass.
Air Force Flight Test Center Edwards AFB, Calif.
Armament Development and Test Center Eglin AFB, Fla.
Aerospace Medical Division Brooks AFB, Tex.
Aeronautical Systems Division Wright-Patterson AFB, Ohio
Air Force Contract Management Division Los Angeles AFS, Calif.
National Range Division Andrews AFB, Md.
Air Force Western Test Range Vandenberg AFB, Calif.
Air Force Eastern Test Range Patrick AFB, Fla.
Arnold Engineering Development Center Arnold AFS, Tenn.
Air Force Special Weapons Center Kirtland AFB, N.M.
Foreign Technology Division Wright-Patterson AFB, Ohio
Air Force Missile Development Center Holloman AFB, N.M.

Figure 36. Organization of the Air Force Systems Command.

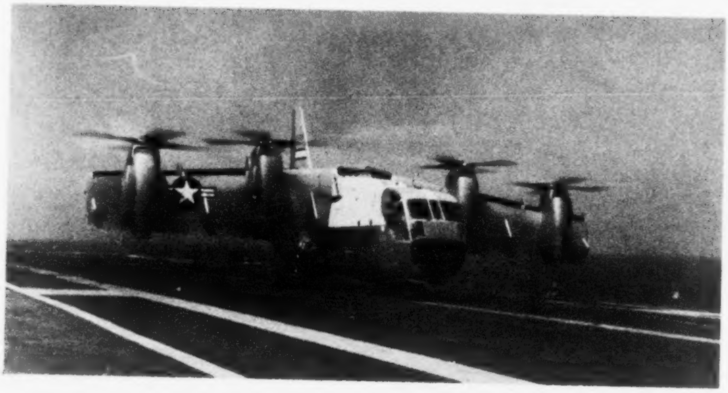


Figure 37. XC–142, a V/STOL aircraft under aeronautical systems division development.

Angeles Air Force Station, California, was formed in 1967 as a realignment of two former AFSC divisions, Ballistic Systems and Space Systems. SAMSO is the Defense Department's major development agency for space and ballistic missiles programs and has the responsibility for research, development and testing of systems hardware and components for both programs.

Aeronautical Systems Division (ASD).—Located at Wright-Patterson Air Force Base, Ohio, ASD manages development of aeronautical systems and related equipment. It has developed a variety of bombers, fighters, helicopters, vertical/short takeoff and landing aircraft (V/STOL), transports, trainers, reconnaissance aircraft, research aircraft, and nonballistic missiles. An example of a V/STOL aircraft under ASD development is shown in Figure 37. Examples are such current projects as the F–111A fighter and the C–5A cargo transport.

Electronic Systems Division (ESD).—Located at L. G. Hancom Field, Massachusetts, alongside OAR's Cambridge Laboratories, ESD plans, designs, procures, tests, installs, and checks out data processing and communications systems that circle the globe. Since all areas which relate to electronics systems are assigned to one division, it is rather easy to notice omissions or possible duplication of work. Also, information is centralized to aid in research and development.

Foreign Technology Division (FTD).—This division, located at Wright-Patterson Air Force Base, Ohio, acquires reports on foreign scientific and technological efforts or the actual equipment in order to lessen the probability of technological surprise from foreign nations. Skilled personnel, along with personnel of other divisions and centers, examine reports and equipment and evaluate them. Their final information is useful in understanding the technological achievements of other nations and in finding weak areas of possible enemies.

AEROSPACE MEDICAL DIVISION (AMD).—This division, located at Brooks Air Force Base, Texas, is the headquarters for a large medical research and educational organization. It conducts research and development programs in support of Air Force systems, conducts personnel research, and meets medical and clinical requirements. The division has also been involved in the selection and training of astronauts and in the research, development, and testing of life support systems to permit astronauts to function in the hostile environment of space. AMD is composed of the USAF School of Aerospace Medicine, at Brooks Air Force Base; Wilford Hall USAF Hospital, at Lackland Air Force Base, Texas; and five laboratories.

NATIONAL RANGE DIVISION (NRD).—Headquartered with the headquarters of the systems Command at Andrews Air Force Base, Maryland, the National Range Division manages for the Department of Defense a single globe-circling tracking network for ICBM's space satellites, launch vehicles, and space probes. The commander of the division also serves as the Deputy Commander for the Global Range for AFSC. The National Range is made up of the Air Force Eastern Test Range and the Air Force Western Test Range.

With its launch site at Cape Kennedy, Florida, the Air Force Eastern Test Range stretches through the Atlantic Ocean to the Indian Ocean, where it is joined by the Western Test Range. Nearly 30,000 military and civilian support workers, scientists, and engineers at Cape Kennedy and Patrick Air Force Base, some 15 miles to the south, are engaged in launching missiles, satellites, and manned space programs. Downrange tracking sites are located at Grand Bahama Island, Eleutheria, San Salvador, Grand Turk, Antigua, and Ascension Island in the Atlantic and near Pretoria in the Republic of South Africa. Ships and aircraft carry tracking instruments to sea and further supplement the tracking system.

The Western Test Range has its launch site at Vandenberg Air Force Base, California. This range extends through the Pacific into the Indian Ocean. Tracking sites are located at Pillar Point on the U.S. mainland; South Point and Kokee Park in Hawaii; and Wake, Midway, Eniwetok, and Canton Islands in the Pacific. The Western Range specializes in launches of satellites into polar orbit and supports the operational training launches of the Strategic Air Command.

Air Force Contract Management Division.—Located at Los Angeles Air Force Station, California, this division is responsible for managing DOD contracts. It is composed of various types of management personnel, such as aeronautical and electronic engineers, comptrollers and accountants, economists, and quality assurance technicians, whose job is to aid the Government hold the line on production costs, insure that time schedules are met, and see that a high-quality product is delivered.

Arnold Engineering Development Center.—Arnold Air Force Station, Tennessee, is the location of this center, in the heart of the Tennessee Valley Authority network of hydroelectric power stations. The location is ideal for securing power to operate its wind tunnels and test facilities. Since this center has the most complete facilities of its kind in the free world, it is extensively used by the armed services, industry, NASA, and educational and research institutions. The specific facilities which provide testing under simulated space flight conditions are the von Karman Gas Dynamics Facility, the Rocket Test Facility, the Propulsion Wind Tunnel, and the Aerospace Environmental Facility.

Air Force Flight Test Center.—At Edwards Air Force Base, California, the Flight Test Center has a man-made 15,000 foot runway and flat, dry lake beds which add natural runways up to 13 miles long. The climatic conditions are extremely favorable in this section of the country and flight testing is possible some 360 days per year.

Here the Air Force performs experimental and acceptance tests of aircraft and aerospace vehicles. The test center is also the home of the USAF Aerospace Research Pilot School, the only school of its kind in the free world, where future space pilots are trained to master the environment of space.

The Flight Test Center is formed for the achievements of the "X" series of research aircraft that have been tested here. After Air Force Captain Chuck Yeager broke the sonic barrier in the X–1 in 1947, the Air Force has continued its program of research until, at the present time, the X–15 has flown faster and higher than any other manned aircraft.

Air Force Missile Development Center.—At Holloman Air Force Base, New Mexico, this center, located on the vast tracks of the White Sands Missile Range, directs the research and development testing of air-to-air missiles, maintains and operates an inertial guidance test facility, and performs rocket firings to help develop reentry technology. Two organizations that are a part of the center are the Balloon Research and Development Test Branch and the 6571st Aeromedical Research Laboratory of the Aerospace Medical Division.

The Balloon Test and Development Branch launches payloads to the edge of space and then successfully tracks and recovers them. The Aeromedical Research Laboratory tests for effects on humans from the various types of space experiments.

The center also includes a 35,000 foot high-speed test track which aids in eliminating design and production errors in space vehicles. The track is used to test guidance systems, ejection seats, missile nose cones, and parachutes. Also located here is an environmental chamber which can simulate every condition of space except weightlessness and radiation.

Armament Development and Test Center.—Facilities at this center, located at Eglin Air Force Base, Florida, include the Eglin Gulf Test Range, covering 45,000 feet over the Gulf of Mexico; 8 other test ranges; and 9 auxiliary fields. Testing covers all types of equipment, bombs, guns, targets, drones, rockets, early warning radars, and airborne counter-measures equipment. Armament Development and Test Center works closely with the Special Operations Force of the Tactical Air Command in testing munitions and other equipment used in special warfare. Results from testing performed by these two organizations have been incorporated into Air Force operations in Southeast Asia and elsewhere.

Air Force Special Weapons Center.—This center, at Kirtland Air Force Base, New Mexico, is the scene of the Air Force testing of nuclear equipment and techniques in the air and laboratory. The center provides operational and technical support for Department of Defense and Atomic Energy Commission programs, and generates and maintains plans for support of nuclear weapons testing. Center facilities test the vulnerability of various equipment to nuclear shock. Much of the testing is carried out jointly with the Air Force Weapons Laboratory of the Research and Technology Division, which is also located at Kirtland Air Force Base.

AIR FORCE LOGISTICS COMMAND (AFLC)

Logistics can be defined as supporting a military force by providing supplies, equipment, transportation, maintenance, construction, facilities, evacuation and movement of personnel, and similar activities. The Confederate general, Nathan B. Forrest, once explained logistics by saying that the best way to win a battle was to "Get there fustest with the mostest." Logistics has also been described as all that part of war which is not included in strategy and tactics. Strategy, tactics and logistics form the three sides of the national defense triangle. Another definition of logistics is "The link between American industry and the American fighting man."

Although the scope of the Air Force Logistics Command (AFLC) does not cover the complete span of all activities included in the foregoing definitions, its areas of responsibility in managing the huge Air Force inventory of supplies, installations, and equipment—in procurement, distribution, storage, and maintenance—are immense. The command controls items ranging from pinhead-size transistors to football-field size radar screens.

Mission and Functions

The mission of AFLC is to provide logistics support and services for Air Force organizations, systems, and other activities. Since we have just examined the Air Force Systems Command, which has some responsibilities in this area, we might begin by differentiating the roles of AFSC and AFLC to provide a better understanding of the latter's mission.

AFSC AND AFLC.—The same 1961 reorganization which created the Systems Command also created the Logistics Command. The change was brought about in part by the Air Force's growing commitment to the developing missile and space effort. When the Department of Defense discontinued the Research and Development Command, it also discontinued the Logistics Command's principal ancestor, the Air Materiel Command. Responsibilities of these two commands were now divided, basically, three ways. Basic research became the task of OAR; systems development, AFSC; and systems support, AFLC.

In the main, it can be said that the Systems Command has charge of development of a new system from the drawing-board stage to the stage where the system has been tested and declared operational, ready to be manufactured in quantity and delivered to the using commands. It then becomes the responsibility of the Logistics Command to oversee production, delivery to supply depots, storage, distribution, and maintenance. Since maintenance, as every home mechanic or automobile owner knows, depends upon availability of spare parts, the Logistics Command has this big responsibility too, and has charge of spare parts procurement as well as distribution. AFLC responsibility for the system continues as long as it is in Air Force use. If C–124 Globemasters built in the early

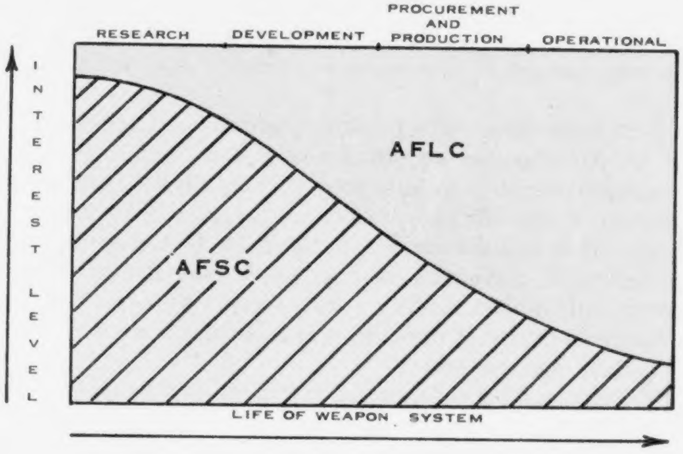


Figure 38.

1950's are still seeing service in MAC and Reserve units, it is AFLC's task to see to it that spare parts for these aircraft are still being manufactured, warehoused and distributed in the needed amounts.

The distinction between systems development and systems support is not a sharp one. There is no precise moment at which the Systems Command's responsibility for a system ends and that of the Logistics Command begins. It is, rather, a matter of varying degrees of responsibility at different times, and it happens gradually, somewhat as depicted in Figure 38. The Logistics Command works closely with the Systems Command during the developmental phases of a weapon system to insure that the new system can be supported logistically once it becomes operational. Therefore, AFLC's interest in the new system begins in the design stage. After all, if the Logistics Command is to be responsible for procurement of spare parts, then it must give much thought to the spare-parts problem quite early in the process. Or, if the item cannot be exposed to the weather in open storage, it will be up to the Logistics Command to provide the proper warehousing. Perhaps the early prediction of a logistic-support problem or happy shortcut by an AFLC expert will have an influence on a system design. Similarly the interest of the Systems Command in an operational or even an obsolescent system continues. What improvements on a system are needed or possible? What requirements for an entirely new system are revealed by the shortcomings of the old? AFSC, in seeking answers to such questions, keeps a close watch on old systems.

AFLC FUNCTIONS.—The Logistics Command is committed to the task of providing the combat air commands with the logistics management necessary to keep their aircraft, missiles, and support equipment at top efficiency. Also, the Logistics Command must provide technical assistance and direction for base materiel activities, such as the commissary, food service, laundry and dry cleaning, mortuary affairs, and clothing sales. While AFLC is responsible for the establishment of operating policies for these services, it does not actually operate them.

The Logistics Command, operating through its air material areas, performs six major steps. These steps are:

1. determine needs
2. procure needed items

3. maintain storage
4. distribute items to users
5. maintain and modify items
6. dispose of items no longer needed

The Logistics Command, in carrying out its mission, has set certain goals. First, AFLC believes that the command must be flexible enough to keep abreast of changing tactics and strategy and ever-increasing improvement in weapon systems. Secondly, the Logistics Command, in cooperation with the Systems Command, strives to reduce the lapse of time between the date on which it is decided to produce the system and the time that it actually becomes available to combat commands. The third goal is to emphasize quality in the equipment. The Logistics Command constantly seeks and develops improved management methods which aid in keeping pace with the complex new weapons, reducing delays, and maintaining Air Force qualitative superiority. Fourthly, AFLC promptly removes from the supply system those items that have become obsolete and all excesses caused by rapid advances in technology and tactics.

Organization

Headquarters AFLC is at Wright-Patterson Air Force Base, Ohio. Compared to the overall size of the command, the headquarters organization is small, amounting to only one percent of the total personnel strength of 140,000. This small headquarters organization is possible because AFLC follows the Air Force philosophy of maximum decentralization of operation. Headquarters establishes policies and monitors activities, but the authority and responsibility for all operations is decentralized. The air materiel areas (AMA's) are the complexes that carry out most of the command's operational functions (Fig. 39). Each AMA has prime responsibility for worldwide logistics management for the weapon systems assigned to it.

Each AMA has certain weapon systems assigned to it. Whenever a call comes into an AMA for a specific part, that air materiel area is responsible for the distribution of that part to the requesting organization. This is accomplished in the shortest possible time, with the maximum of efficiency. For example, San Antonio AMA supports the new C–5A currently under development. Whenever a C–5A needs a replacement part, the organizational unit will call the San Antonio AMA and receive immediate service by air cargo delivery.

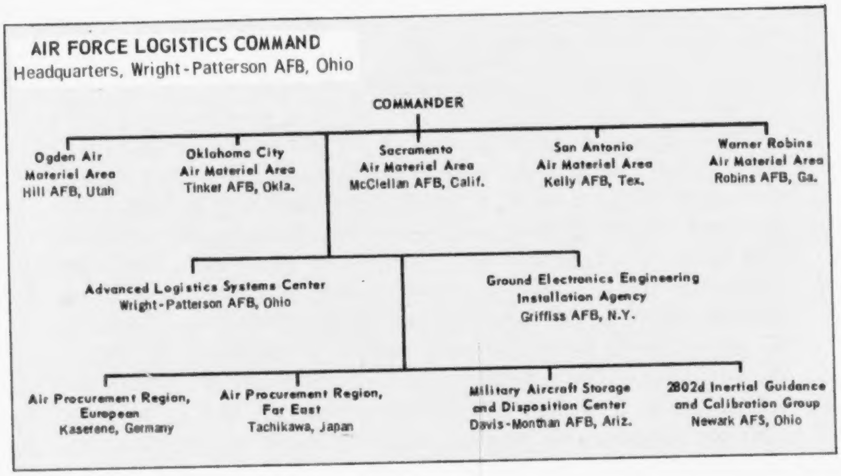

AIR FORCE LOGISTICS COMMAND
Headquarters, Wright-Patterson AFB, Ohio
COMMANDER
Ogden Air Materiel Area Hill AFB, Utah
Oklahoma City Air Materiel Area Tinker AFB, Okla.
Sacramento Air Materiel Area McClellan AFB, Calif.
San Antonio Air Materiel Area Kelly AFB, Tex.
Warner Robins Air Materiel Area Robins AFB, Ga.
Advanced Logistics Systems Center Wright-Patterson AFB, Ohio
Ground Electronics Engineering Installation Agency Griffiss AFB, N.Y.
Air Procurement Region, European Kaserene, Germany
Air Procurement Region, Far East Tachikawa, Japan
Military Aircraft Storage and Disposition Center Davis-Monthan AFB, Ariz.
2802d Inertial Guidance and Calibration Group Newark AFS, Ohio

Figure 39. The AFLC organization.

The United States Air Force no longer stockpiles large quantities of supplies in overseas depots. Slow supply lines are obsolete. The Logistics Command has revolutionized its logistics concept and uses a new concept of direct support calls for high-speed movement from the United States of priority and high-value materials.

While there were originally nine AMAs, four have been phased out since 1964. These four areas were located at Rome, New York; Middletown, Pennsylvania; San Bernardino, California; and Mobile, Alabama. The remaining five AMA's have expanded and absorbed the workload. These areas are located at Oklahoma City, Oklahoma; Ogden, Utah; San Antonio, Texas; Sacramento, California; and Robins Air Force Base, Georgia.

The Logistics Command also directs the following activities:

The 2802d Inertial Guidance and Calibration Group
The Ground Electronics Engineering Installation Agency (GEEIA)
The Military Aircraft Storage and Disposition Center

The 2802d Inertial Guidance and Calibration Group at Newark, Ohio, is responsible for testing, repairing, and calibrating the inertial guidance and control systems on the Minuteman and Titan missiles. The GEEIA, Griffis Air Force Base, New York, is the single-manager agency for engineering, installation, and on-site maintenance of

Air Force communications-electronics systems throughout the world. The Military Aircraft Storage and Disposition Center at Davis-Monthan Air Force Base, Arizona, is responsible for disposing of every Air Force, Navy, or Army aircraft that has become excess to active needs of the military.

EDUCATION AND TRAINING

A pilot controlling his million dollar aircraft as it soars to 50,000 feet and accelerates to mach 2 faces well over 100 controls and instruments, numerous dials and warning lights which must be understood. His machine is maintained on the ground by skilled personnel, performing equally difficult tasks in keeping the aircraft ready for flight at all times.

The Air Force must assure that its personnel are highly trained in their respective careers. They must be fully capable of coping with advancements in technology or changes in environment, whether in the cockpit, rocket sled, silo, balloon, spacecraft, on patrol at an air base in Vietnam, or in any of a thousand other types of assignment. Others must be trained for less glamourous but equally exacting tasks in supply, administration, and other support services, where computer technology is rapidly changing the scene.

Aside from specific career training, the Air Force must instill in its personnel those qualities of professional pride, dedication, and patriotism that contribute to courage, morale and achievement. A free society does not expect its military people to be robots trained to perform a task but ignorant of the values they are fighting to preserve. Airmen and officers at all levels must learn the techniques of leadership. Higher officers must be well informed not only in the professional aspects of command and staff work, but in numerous areas of history, current political and international affairs,

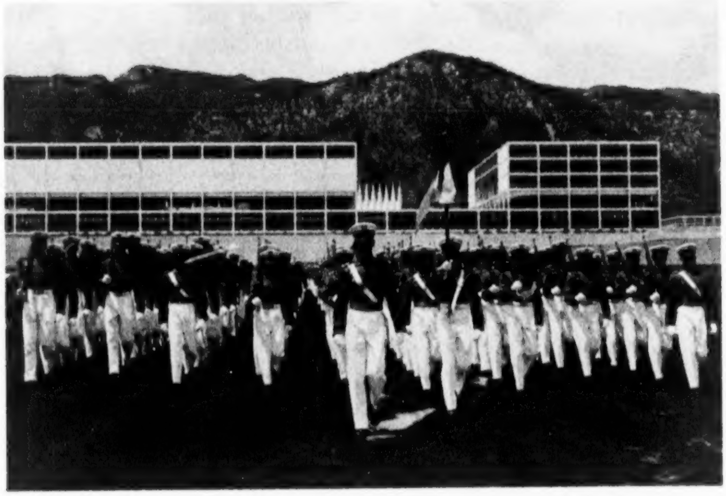


Figure 40. Air Force Academy cadets on the march.

economics and psychological factors that offer insight into today's world and the Nation's military posture in it.

All these aspects of training and education are covered by the Air Force's massive education and training system, which is centered in three organizations: the Air Force Academy, the Air University, and the Air Training Command.

Air Force Academy

The United States Air Force Academy (USAFA), established in 1954, is the newest of the three military academies. Located at Colorado Springs, Colorado, in the foothills of the Rocky Mountains, the Air Force Academy prepares young men for careers as officers in the Air Force. The Academy provides four years of undergraduate study leading to a baccalaureate degree in science. The program of study is designed to meet both present and future needs of the Air Force.

The mission of the Academy is to provide instruction, experience, and motivation to each cadet so that he can graduate with the knowledge, character, and qualities of leadership essential to his development as a career officer in the Air Force. Cadets who complete the four year course of study graduate with B.S. degrees and commissions as second lieutenants in the Regular Air Force.

Designed to provide a foundation for further development in any of the numerous career fields available to Air Force officers, the Academy curriculum is neither engineering nor liberal arts. Its 144½ semester hours are balanced between basic-applied sciences and the humanities and the arts.

In addition to their academic studies, cadets receive instruction in military skills, leadership, and flying training. Cadets also receive pilot-navigation indoctrination and an expanded space technology program.

Air University (AU)

Maxwell Air Force Base, Alabama, is the location of the headquarters and the greater part of the educational facilities of the Air University. Maxwell in pre-World War I days was a field used by Orville Wright for experimentation with his flying machines. In the 1930's, it was the site of the famed U.S. Army Air Corps Tactical School, where many great future Air Force leaders were trained, and where basic doctrine on employment of air power was formulated. This school was the principal forerunner of the present Air University, established at Maxwell in January 1946, more than a year ahead of the establishment of the Air Force itself as a separate service.

With major-command status and reporting directly to Headquarters USAF, the Air University today is the doctrinal and higher educational command of the Air Force. Its mission includes supervising various schools and activities which comprise the Air University system. It conducts research associated with its mission and administers numerous programs and courses designed to provide Air

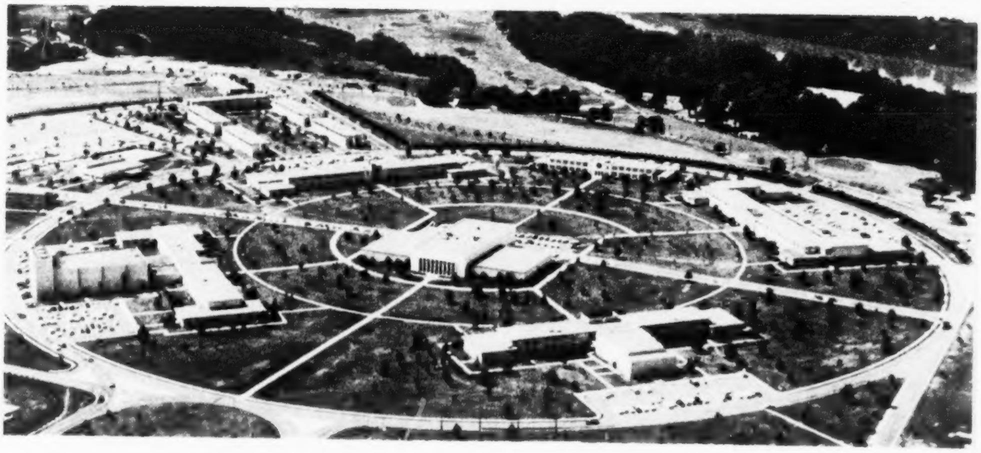


Figure 41. Air University academic circle.

Force officers with specialized command-staff skills. In this way, outstanding officers equip themselves with the knowledge and skills necessary for assuming more important assignments in command and staff positions throughout the Air Force.

The core of the Air University system is the professional military education program consisting of the Squadron Officer School, the majority of whose students are first lieutenants; the Air Command and Staff College (captains and majors); and the Air War College (lieutenant colonels). An officer can attend these schools at various times in his career as he advances in rank, experience and responsibility.

The Air Force Junior ROTC student studying the present text is a member of the Air University family, for the Air Force Reserve Officer Training Corps is a major branch of the Air University. From its headquarters at Maxwell Air Force Base, AFROTC administers programs in partnership with 175 colleges and universities throughout the United States with over 70,000 cadets taking two-year and four-year courses, leading toward a second lieutenant's commission in the Air Force. The Junior AFROTC program began in 1966 with a pilot program in 20 high schools throughout the Nation, and is now rapidly expanding.

The Air University has a second "campus" at Wright-Patterson Air Force Base, Ohio, where another major AU branch is located.

This is the Air Force Institute of Technology, which conducts educational programs for over 8,000 students in technological, scientific, and other specialty areas of the Air Force. The institute also conducts a program for enrolling promising Air Force officers in civilian colleges and universities and in selected industries.

The Extension Course Institute, headquartered at Gunter Air Force Base, Alabama, a few miles away from Maxwell, is the correspondence school of the Air Force, bringing its educational and training program to students at every Air Force base in the world and to thousands of Reserve, Air National Guard, and other qualified personnel as well. A total of 300,000 to 400,000 students is enrolled at any one time. Although the Extension Course Institute is organizationally a part of the Air University, its program of some 200 different courses includes technical and career development instruction developed in the Air Training Command as well as the Air University.

Other Air University schools, located at Maxwell, include the Institute of Professional Development, instructing in the uses of Air Force striking power and the technology of current and future aerospace weapon systems; the Academic Instructor and Allied Officer School, which increases the effectiveness of Air Force instructors and also instructs foreign officers in the English language, the Air Force organization, and cultural patterns of the United States; and the Air Force Chaplain School, added to the AU family in 1966, to instruct recently-commissioned chaplains in the professional and military subjects related to their duties.

The Aerospace Studies Institute is a research and doctrinal center, and the Air University Library supports the Air University and the entire Air Force with its collection of more than 275,000 books, 500,000 documents, and 300,000 maps.

Air Training Command (ATC)

Another important component of Air Force education and training is the Air Training Command (ATC). This major air command is the world's largest training command. It provides basic military training to over 100,000 airmen and officers each year. ATC provides more than 2,700 pilots and 1,000 navigators every year and, in addition, conducts basic and advanced training in most Air Force specialty fields for more than 400,000 officers and airmen. A student enrollment of above 575,000 per year is dispersed over 16 training bases in the United States and about 200 detachments.

World War II played an important role in the establishment of this air command. The increasing need for trained personnel during the war forced the creation of improved methods of instruction and training. The Army Air Force Training Command became responsible for much of the training at this time and on 1 July 1946, the AAF Training Command became the Air Training Command. The Korean conflict brought about further changes in ATC and the command continued to expand. Headquarters ATC, which had previously been at Scott Air Force Base, Illinois, moved in 1957 to its present site at Randolph Air Force Base, Texas.

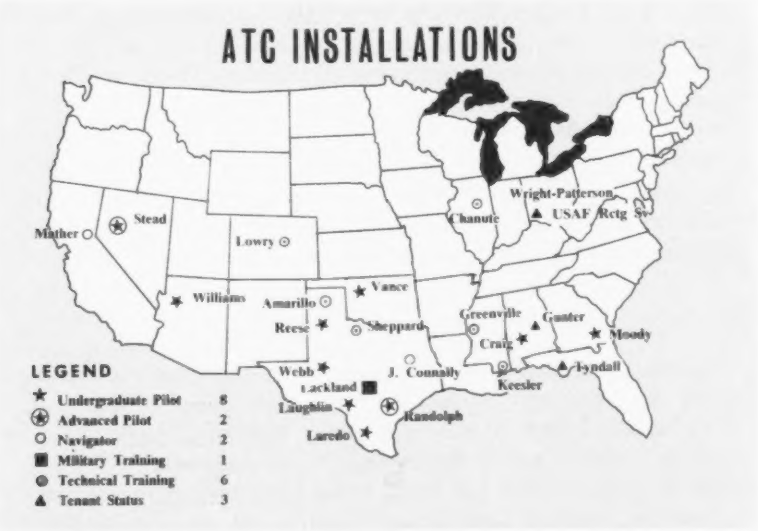

ATC INSTALLATIONS
Mather
Stead
Lowry
Chanute
Wright-Patterson
USAF Rctg Sv
Williams
Amarillo
Vance
Reese
Sheppard
Greenville
Gunter
Craig
Moody
Webb
J. Connally
Keesler
Tyndall
Lackland
Laughlin
Randolph
Laredo
LEGEND
★ Undergraduate Pilot 8
⊛ Advanced Pilot 2
○ Navigator 2
■ Military Training 1
⊙ Technical Training 6
▲ Tenant Status 3

Figure 42.

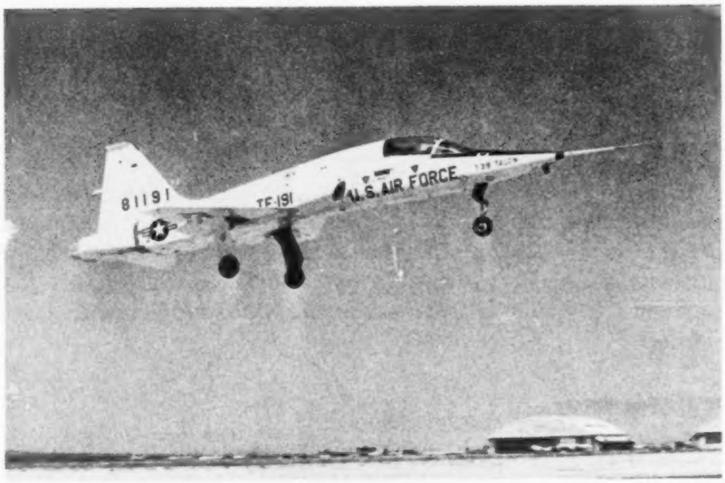


Figure 43. Flight training — T-38.

The Air Training Command's mission is fourfold: recruiting; military training; technical training, and flying training. For more than 23 years, ATC has supplied the trained manpower for the operation and maintenance of the world's most powerful aerospace force. To carry out its mission, ATC supervises a recruiting wing; military, technical, and flying schools; special schools for training officer candidates; a marksmanship center; and mobile and field training detachments (Fig. 42).

The Training Command provides the main manpower input of the Air Force. All airmen, and a substantial proportion of officers, receive basic and specialized training under ATC. In recent years, three out of four graduates of basic military training have gone on to take technical training in one or more of 1,100 courses, administered at or from five technical training centers: Amarillo Air Force Base, Texas; Chanute Air Force Base, Illinois; Keesler Air Force Base, Mississippi; Lowry Air Force Base, Colorado; and Sheppard Air Force Base, Texas. The pilot training program of ATC consists mainly of the undergraduate pilot training course by which a flying cadet wins his wings in a program that begins with only 30 hours in a light, propeller driven trainer and proceeds quickly into jets. The trainee then spends 90 hours in the T–37 jet trainer (Fig. 43) and

120 hours in the supersonic T–38. Advanced training in operations aircraft like the F–105 fighter or the C–141 transport is the responsibility of an operating command like TAC or MAC.

ADDITIONAL SUPPORT FUNCTIONS

Other Air Force support commands and agencies are given brief mention below, although their importance may equal that of some of the commands and agencies treated at greater length above. These organizations perform such tasks as communications, security, Reserve administration, charting and information, and accounting and finance.

Air Force Communications Service (AFCS)

Scott Air Force Base, Illinois, is the location of Headquarters, Air Force Communications Service (AFCS). This major command is responsible for operation of worldwide communications, air traffic control, and air navigation systems for the Air Force and other Government agencies. In other words, AFCS provides global communications, as well as fixed and mobile flight facilities, to individual commands (Fig. 44).

This command, which operates throughout the world, is a tenant command and has no bases of its own. All AFCS personnel are assigned to bases operated by other commands. It has units on every Air Force base in the world and maintains some remote installations of its own. As a supporting command, AFCS provides on-base communications at all bases except those run by ADC and SAC (which as we have noted, have their own command-and-control systems-SAGE, for example). AFCS also provides on-base intercommunications systems, fire and crash alarms, air police and security alerting systems, and closed-circuit television. Long distance communication is also provided to link Air Force installations around the globe.

In addition to these functions, AFCS provides air navigation aids such as radio ranges, direction finders, homing beacons, instrument landing systems, and tactical navigation aids. In this, and all of its endeavors, AFCS maintains a constant capability to provide emergency support anywhere in the world on a short notice.

The role of the air traffic controller is described in the words of the Commander, AFCS, in a speech delivered in May 1967: "In Southeast Asia, AFCS is daily playing a vital role in the challenging task of air traffic control. In Vietnam, three air bases individually exceed the traffic count at O'Hare International Airport in Chicago (busiest airport in the United States). . . Air Force pilots are known in combat for staying to literally their last drop of gas. Consequently, our air traffic controllers must be prepared to get them on the ground quickly and efficiently when they return to home base. This we do. In the 5½ years of AFCS operation, our air traffic controllers

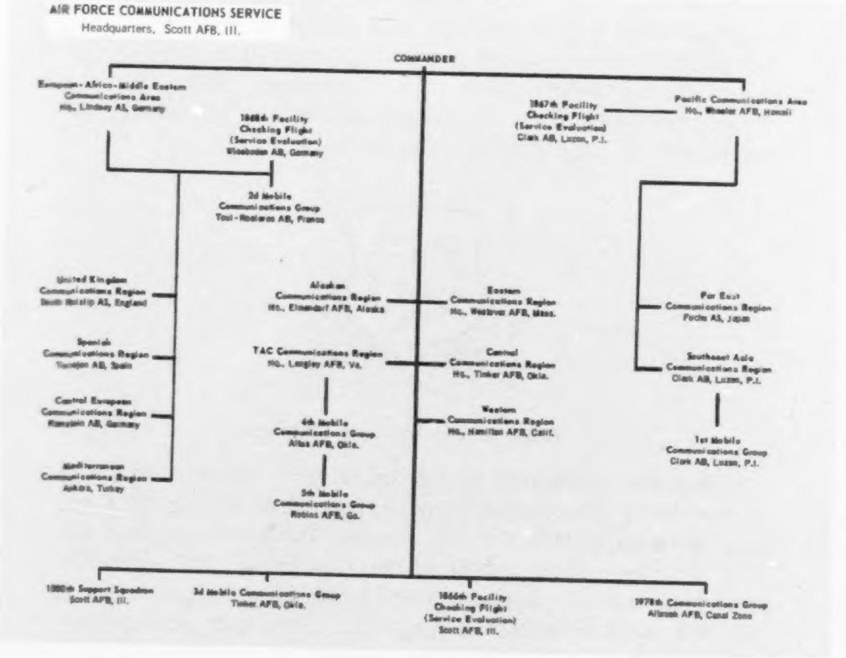
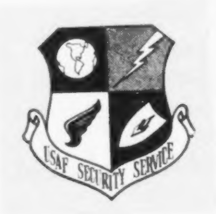

AIR FORCE COMMUNICATIONS SERVICE
Headquarters, Scott AFB, Ill.
COMMANDER
European-Africa-Middle Eastern Communications Area Hq., Lindsey AS, Germany
1868th Facility Checking Flight (Service Evaluation) Wiesbaden AB, Germany
2d Mobile Communications Group Toul-Rosieres AB, France
1867th Facility Checking Flight (Service Evaluation) Clark AB, Luzon, P.I.
Pacific Communications Area Hq., Wheeler AFB, Hawaii
United Kingdom Communications Region South Ruislip AS, England
Spanish Communications Region Torrejon AB, Spain
Central European Communications Region Ramstein AB, Germany
Mediterranean Communications Region Ankara, Turkey
Alaskan Communications Region Hq., Elmendorf AFB, Alaska
TAC Communications Region Hq., Langley AFB, Va.
4th Mobile Communications Group Altus AFB, Okla.
5th Mobile Communications Group Robins AFB, Ga.
Eastern Communications Region Hq., Westover AFB, Mass.
Central Communications Region Hq., Tinker AFB, Okla.
Western Communications Region Hq., Hamilton AFB, Calif.
Far East Communications Region Fuchu AS, Japan
Southeast Asia Communications Region Clark AB, Luzon, P.I.
1st Mobile Communications Group Clark AB, Luzon, P.I.
1900th Support Squadron Scott AFB, Ill.
3d Mobile Communications Group Tinker AFB, Okla.
1866th Facility Checking Flight (Service Evaluation) Scott AFB, Ill.
1978th Communications Group Albrook AFB, Canal Zone

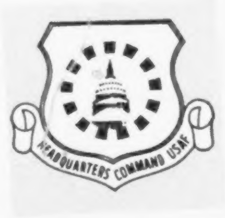
Figure 44. AFCS organization.

have saved just over 700 aircraft from what would have been considered certain loss without the assistance of these dedicated men."

United States Air Force Security Service (USAFSS)

Headquartered at Kelly Air Force Base, Texas, USAFSS became a major air command in October 1948. This command monitors all Air Force communications to insure compliance with established communications security practices and procedures. USAFSS units occasionally conduct research in communications phenomena in support of various elements of the U.S. Government. Other functions of this command include the storage, distribution, accounting, and maintenance of cryptographic materials.[7]





Headquarters Command, USAF

Headquarters Command has the most varied support mission in the Air Force. This command, headquartered at Bolling Air Force Base, Washington, D.C. not only supports Headquarters USAF and other Air Force units located in the Washington, D.C. area, but also administratively supports some 35,000 Air Force personnel in over 700 installations around the world. Air Force personnel assigned to the command include those directly assigned to various unified commands or Government agencies such as NORAD, NATO, the Federal Aviation Administration, the Defense Supply Agency, various Military Assistance and Advisory Groups detailed to foreign nations, and the National Aeronautics and Space Administration (thus making Headquarters Command the administrative home command of all Air Force astronauts.) Overseas the command's 1141st Special Activities Squadron, largest squadron in the Air Force, has over 3,000 personnel assigned throughout Europe, Africa, and the Middle East. The command is directly interested in the President and in foreign dignitaries. It provides housing and dining facilities for Air Force personnel in the District of Columbia area. Also part of this command are the famed U.S. Air Force Band and USAF Honor Guard. The command operates the Air Force Hospital at Andrews Air Force Base, Maryland. This facility provides extensive medical treatment for military personnel and dependents.

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[7] Materials related to encoding or decoding messages, which nowadays include the use of mechanical or electronic devices.

Headquarters Air Force Reserve (AFRES)

Headquarters Air Force Reserve (AFRES), Robins AFB, Georgia, is a newly established separate operating agency under the Chief

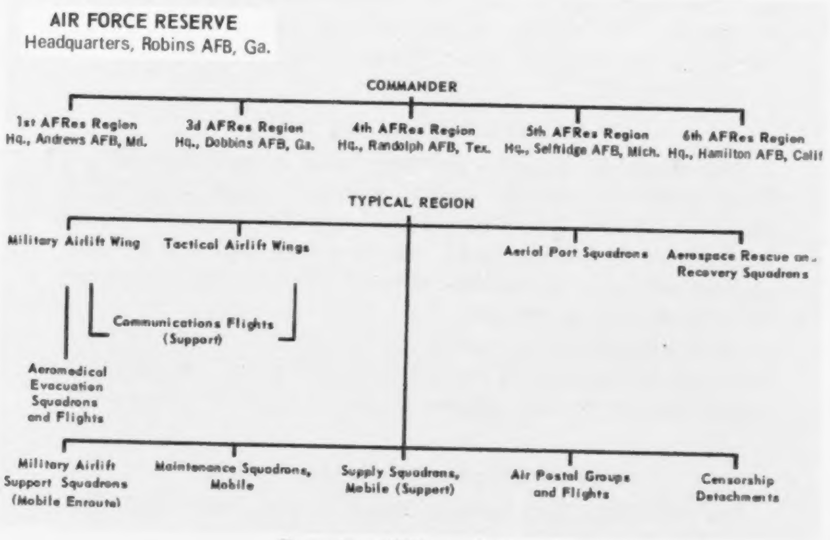
AIR FORCE RESERVE
Headquarters, Robins AFB, Ga.
COMMANDER
1st AFRes Region Hq., Andrews AFB, Md.
3d AFRes Region Hq., Dobbins AFB, Ga.
4th AFRes Region Hq., Randolph AFB, Tex.
5th AFRes Region Hq., Selfridge AFB, Mich.
6th AFRes Region Hq., Hamilton AFB, Calif
TYPICAL REGION
Military Airlift Wing
Tactical Airlift Wings
Aerial Port Squadrons
Aerospace Rescue and Recovery Squadrons
Communications Flights (Support)
Aeromedical Evacuation Squadrons and Flights
Military Airlift Support Squadrons (Mobile Enroute)
Maintenance Squadrons, Mobile
Supply Squadrons, Mobile (Support)
Air Postal Groups and Flights
Censorship Detachments

Figure 45. AFRES organization.

of Staff, USAF, with technical direction and control provided by the Office of Air Force Reserve. AFRES is responsible for the direction and training of the Nation's thousands of Air Force Reservists. The agency provides field commander supervision over Air Force Reserve organized units and individual reservists assigned to augment units under the agency's supervision in the event of mobilization.

AFRES is divided into six regions, which are in turn divided into flying units and nonflying units. The flying units include military airlift wings, tactical airlift wings, aerospace rescue and recovery squadrons, and aeromedical evacuation squadrons. Nonflying units include aerial post squadrons, military airlift support squadrons (mobile en route), maintenance squadrons (mobile), supply squadrons (mobile support), medical service units, air postal units, and censorship units. Flying units perform a wide variety of missions ranging from mercy missions to air-lifting cargo and presents to U.S. troops in Vietnam. The Reserve logs are full of similar events, vividly telling of AFRES participation in numerous operations.

Air Force Reserve training programs are constantly updated. This is to assure the commands, to which the Reserve units will be assigned in event of war, that the Reserve troops will be prepared for action. This training, coupled with the dedication of the Reservists, is the mainstay of the "Ready Now" Air Force Reserve.

Air Reserve Personnel Center (ARPC)

Also under the direction and supervision of the Office of Air Force Reserve is the Air Reserve Personnel Center (ARPC) at Denver, Colorado. The Center administers and participates in the development of policies, plans, and programs applicable to management and personnel administration of Air Force Reserve personnel who are not on extended active duty. In addition, the Center provides administrative capability to effect mobilization of Air Force Reservists in the event of a national emergency, and maintains personnel data and provides reports pertaining to Air Force reservists.

Air Force Data Systems Design Center (AFDSDC)

The Air Force Data Systems Design Center (AFDSDC), Suitland, Maryland, was established as a separate operating agency in

October 1967. Although it is one of the smallest agencies, it has the administrative and procedural functions and responsibilities of a major command. The Center's mission is to analyze, design, develop, program, test, implement, and maintain all automated data systems required by Headquarters USAF.

The Center now has responsibility for centralized data-systems development and computer programming for all major commands and Air Force bases worldwide and works directly with 200 worldwide computer installations, including Vietnam. This number will be increased to 300 with the addition of the new Burroughs 3500 and its satellite system scheduled for early 1969.

Aeronautical Chart and Information Center (ACIC)

The Aeronautical Chart and Information Center provides the Air Force and other agencies with aerospace charts, graphic and textual target materials, and publications and documents containing geographical information. ACIC is a separate operating agency under Headquarters USAF which has major command responsibility. Headquarters, ACIC, is at St. Louis, Missouri. From this focal point, ACIC controls its organization which provides personnel for various types of charting missions.

The ACIC mission includes four major areas: Air Target Materials, Air Navigation and Planning Charts, Flight Information Publications, and Services. Air Target Materials support intelligence and operation activities, including premission studies. Air Navigation and Planning charts are used for in-flight navigation, preflight planning, mission analysis, intelligence briefing, and other flight missions of the Air Force. Flight Information Publications (FLIP's) include planning, en-route, and terminal information. They provide air traffic control and air navigation data for all-weather operation of military aircraft.

Air Force Accounting and Finance (AFAFC)

Denver, Colorado, is the home of the Air Force Accounting and Finance Center. This separate operating agency enlists the aid of 1,800 civilian and military personnel to accomplish its mission of providing top notch accounting and payment of Air Force men and women. This center handles all Air Force financial tasks and provides financial information to high-level Washington leaders.

SUMMARY

In the first chapter of this text we considered some of the "why's" and "wherefore's" of the vast array of military power maintained by the United States—the national policies and objectives which the Air Force and other services must serve. Three subsequent chapters dealt specifically with the three combat arms of the Air Force—the Strategic Air Command, the Aerospace Defense Command, and the Tactical Air Command and associated overseas tactical air forces. In this chapter we have considered the equally important subject of how these forces are backed up by Air Force commands which provide airlift, technical services, supply, communications, research and development, education and training, and other services which support the combat forces.

The Military Airlift Command, because it flies aircraft and carries its activities overseas and sometimes close to battlefronts, is considered an operational rather than a support command. Nevertheless, we have considered it in this chapter because, in both its aerial logistics pipeline operations and its technical services, it indeed supports other Air Force commands. Its 21st and 22nd air forces girdle the globe to carry personnel and cargo to all areas where U.S. forces are committed. Its airlift capability is augmented by commerical cargo planes of the Civil Reserve Air Fleet under contract. The MAC fleet itself, from year to year, increases its airlift capacity while decreasing the number of its aircraft by bringing in larger and faster C–141 jet transports to replace the aging propeller-driven giant, the C–124. Ultimately the C–141 will fly in partnership with an even larger jet transport, the C–5A. The technical services of MAC include the Air Weather Service, the Aerospace Rescue and Recovery Service, the Aerospace Audio-Visual Service, and the 1370th Photomapping Wing, involved in cartographic and geodetic work.

If the Air Force is to hold its technological lead in aerospace, it needs intensive and extensive research-and-development support. The Office of Aerospace Research conducts basic research in fields related to aerospace. The Air Force Systems Command brings forth the new designs for aircraft and weapon systems, and works in partnership with NASA and other agencies in numerous missile and space projects. The tremendous outlay of AFSC installations includes transoceanic missile ranges, testing facilities for aircraft, weapons, and missiles, and laboratories.

Working in close partnership with the Systems Command is the Air Force Logistics Command, which must provide for logistic support of a system after it passes from the development to the production and use stages. Therefore, AFLC, too, must be in on the design and development stage, so it can plan for this logistic support. AFLC handles storage and distribution of complete systems through its branches, called air materiel areas.

Because of the highly complex nature of Air Force equipment and systems, Air Force education and training commands have a huge task. Not only technical training, but also general military indoctrination and development of leadership knowledgeable in many fields is required. The Air Force Academy takes its place beside West Point and Annapolis as one of the U.S. academies for officer training. The Air University is a prime Air Force doctrinal center and provides professional education for officers. It also administers the Air Force ROTC program in colleges and universities and the Air Force Junior ROTC program in high schools. The Air Training Command administers the vast technical training program of the Air Force, gives basic indoctrination and training to recruits, and provides the undergraduate pilot training program by which Air Force flyers win their wings.

The Air Force Communications Service maintains the world-wide communications network of the Air Force and is the parent command for air traffic controllers at the bases of most commands. Other support commands and agencies include the United States Air Force Security Service; Headquarters Command, USAF; Headquarters Air Force Reserves, which supervises the Reserve program; the Aeronautical Chart and Information Center; the Air Force Accounting and Finance Center; the Air Force Data Systems Design Center; and the Air Reserve Personnel Center.

REVIEW QUESTIONS

1. **Compare the airlift function of MAC with that of tactical airlift forces.**
2. **What Air Force commands are served by the Air Weather Service?**
3. **What is the meaning of the word "systems" in Air Force Systems Command?**
4. **Compare the functions of AFSC and AFLC in the life cycle of a system.**
5. **What is an air materiel area, and what are some of its responsibilities?**
6. **Which command is the parent command of the Air Force Junior ROTC?**
7. **Does the Air Training Command train pilots to fly supersonic jets?**
8. **Which command supervises Air Force Reserve and Air National Guard activities?**

THINGS TO DO

1. Report on MAC's newest aeromedical aircraft, the C–9A. Give details about the size and design of the C–9A, and describe the special accommodations that are provided for transporting patients. If possible, accompany your report with pictures.
2. Determine which USAF Commands are represented at air bases and installations in your home state.

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US.......
Army
Navy
Marines

Chapter 6

Army, Navy, and Marine Corps Aerospace Forces

THIS CHAPTER discusses the aviation components of the Army, Navy, and Marine Corps and explains how aviation activitie fit into the field organization and operations of these services. The reason for separate military aviation services is also discussed. The chapter describes the types of aircraft used and discusses the long-range missiles of the Army and the Navy, particularly the Fleet Ballistic Missile system of the Navy. When you have studied this chapter, you should be able to do the following: (1) explain the nature of Army aviation in relation to Army field organizational requirements and operational concepts; (2) identify the aircraft and missiles used by the Army; and (3) discuss the missions and capabilities of the Navy and Marine Corps aviation services.

IN THIS CHAPTER, we shall look at the general mission and makeup of the Army, Navy, and Marine Corps only briefly, concentrating on the respective services' air arms. Our intent is to obtain a general idea of the roles of the Army, Navy, and Marine Corps in military aerospace. Some mention will be made of certain missiles employed by the Army and Navy insofar as they invite comparison with certain Air Force weapons and constitute a part of the Nation's total nuclear aerospace capability.

UNITED STATES ARMY

The role of the Army is to accomplish any land-force task of the United States necessary to reduce unrest, preserve stability, and maintain peace under law. Basically the Army must be able to fight and defeat the enemy and control land and people during and after the conflict. Its primary mission is to conduct prompt and sustained combat on land. It must be able to fight wherever and whenever called upon.

With today's massive Communist threat, the Army must be prepared for a wide range of operations. It may be involved in countering the tensions of cold war tactics or in outright combat. Types of actions may vary from counterinsurgency actions against guerrillas to full-scale organized infantry assaults. It must be prepared for nuclear or nonnuclear war. In reference to the three main missions of U.S. armed forces as currently understood—strategic offensive, strategic defensive, and general purpose—the Army is involved in the latter two. Its strategic defensive forces, as we have seen, are integrated with those of the other services under NORAD. The major part of its forces are general purpose forces, integrated with those of other services in theater commands and the Strike Command.

We shall not examine the overall organization of the Army here but describe only as much of its field organization as is necessary for a better understanding of the framework within which Army aviation operates. First, however, let us consider the question of how Army aviation fits in with that of the Air Force.

Army-Air Force Aviation Coordination

Since the creation of the Air Force as a separate service in 1947, the Army has continued to be very active in aviation. It has developed and maintained thousands of aircraft, trained thousands of aircrews, and developed doctrine and tactics for the employment of aviation. Army aviation, however, has always been special in nature, designed to complement rather than rival that of the Air Force. Its role is limited to that of supporting the operations of land forces. Its primary missions are to give combat mobility to these land forces (but not to airlift them over great distances), and to provide them with means of command and control and logistic support. Observation and reconnaissance, and, increasingly, de-

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livery of fire on the enemy from the air, are other functions of Army aviation.

In Army employment, the ability of aircraft to land in and take off from small clearings or rough terrain, or, at best, short and unimproved landing strips, has long been regarded as paramount. Hence Army emphasis has been on rotary-wing aircraft (helicopters), supplemented by fixed-wing aircraft that are generally small and light, or have STOL capability.

Nevertheless, some of these functions of Army aviation have overlapped those of certain tactical Air Force elements, especially in such operations as short-range tactical airlift, reconnaissance, and close combat support. Both services formerly used both helicopters and fixed-wing aircraft in similar missions. Both have been and continue to be interested in research and development of V/STOL aircraft. In 1966, however, the two services did much to clarify the situation when the Joint Chiefs of Staff reached an agreement on roles and missions of Army and Air Force aviation.

The agreement reaffirms the Army emphasis on helicopters and the Air Force emphasis on fixed-wing aircraft. Henceforth, the Air Force will limit its use of helicopters to search-and-rescue missions.[8] The Army, in turn, has relinquished its operation of two medium-light STOL transport aircraft, the C–7 Caribou and the C–8 Buffalo, to the Air Force, but has retained use of a smaller fixed-wing transport called the Otter. The Army now limits its use of fixed-wing aircraft to light planes of the utility and observation types for reconnaissance, fire adjustment, command, and administrative uses. For numerous similar and other logistic and combat tasks, the Army uses helicopters and more helicopters, large and small. Both services, along with the Navy, continue joint sponsorship of research and development of V/STOL aircraft.

Whatever questions remain concerning which type of aircraft, from which service, should be used for a given mission, are for the ground commander to decide on the basis of knowledge and experience. For example, take the question of whether a certain enemy position should be attacked by an Army "aerial artillery" helicopter armed with machine guns and "Mighty Mouse" rockets, or by the heavier firepower of an Air Force F–100 jet fighter, or by the sustained firepower of ground artillery. If ground artillery is the answer, should the guns, crews, and ammunition be brought into position overland, or by means of Army Chinook helicopters, or by an Air Force transport plane, which can also airdrop guns, ammunition, and supplies without landing? Since the commander has the backup of a smooth-working joint Army-Air Force (and sometimes Navy) communications network, he will make his decision on the basis of knowing the situation and knowing what Army, Navy, or Air Force aviation resources are available in the area. He must also possess a broader knowledge of the capabilities and limitations of various Army, Navy, and Air Force aviation resources, and know which is best for a particular task. Interservice teamwork, built up by joint training and maneuvers, is the basic answer.

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[8] The agreement was amended in June 1967 to permit certain limited additional Air Force helicopter uses not discussed here.

Another example of interservice teamwork would be the evacuation of a wounded soldier from the spot where he fell to a hospital in the United States. The trip might begin under fire in an Army helicopter, continue in an Air Force C–123, and then, for the transoceanic flight, a jet C–135 or C–141 of the Military Airlift Command.

Army Aviation Organization and Employment

To understand the Army way of using aviation, one must understand something about the Army's field organization. In the field, the various Army arms and services—such as armor, artillery, signal, and aviation—lose their separate identities and higher command structures and become part of combined forces. For example, armed helicopters used to attack ground targets are called "aerial artillery" and are placed under the same command with ground artillery. All these elements can usually be found in one *division*, the main unit of combined arms and services. Divisions can be grouped in larger organizations called corps or still larger forces of several corps called field armies. Certain types of units such as aviation and artillery can either belong to divisions or be pooled at corps level for flexible employment over a large battlefront where several divisions are fighting, but a better understanding of employment of such forces comes from a closer look at the division.

Divisions vary in personnel strength from about 13,000 to 16,000. They can almost be called complete, if small, "armies," since they have their own logistic and support as well as combat forces and can carry on sustained operations either independently or as part of a larger force. There are five types of division: infantry, mechanized infantry, armored, airborne, and airmobile. This does not mean that an entire division consists of one type of combat element, only that these elements are balanced differently. Both an armored division and an infantry division, for example, have both tank and infantry units, but the proportions vary. So do the kinds and amounts of artillery, aviation, and other components. Let us look at the aviation of two types of division: infantry, and airmobile.

An infantry division has about 100 aircraft, mostly helicopters. Some of these are assigned to an air cavalry troop to help this element provide reconnaissance and security for the division. Others are used by the division artillery units to provide command and control and aerial fire adjustment. A few aircraft are assigned to each brigade headquarters for command and control purposes. Almost half of an infantry division's aircraft belong to an aviation battalion, which provides general aviation support to these other elements and also includes an airmobile company for the airlifting and supply of assault elements of infantry (Fig. 46). To keep all these aircraft in proper condition, the division has its own aircraft maintenance company, which also has a capability for repair of avionics equipment.

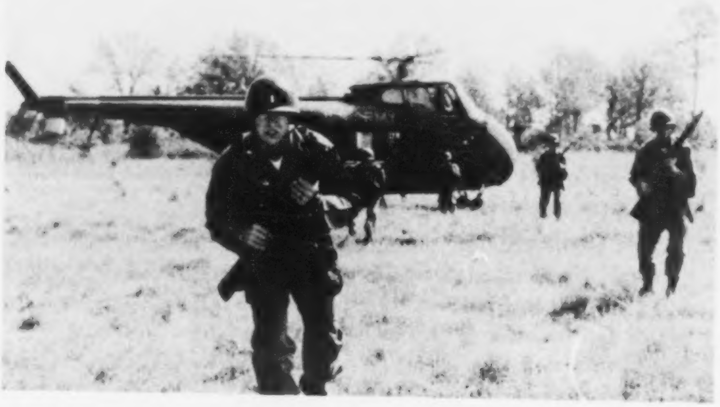

Figure 46. Infantrymen transported to battlefield by UH–1 helicopter.

The aviation of most other divisions is about the same in quantity, if different in makeup. An exception is the new airmobile division, the first of which was created in 1965. It deserves special mention here since it is the one that makes maximum use of Army aviation. An airmobile division is equipped with no less than 425 helicopters plus a half-dozen or so fixed-wing observation aircraft. More than half of this aviation is organized in an aviation group, with three battalions; the rest is broken into smaller units to serve as air cavalry, and support artillery, headquarters, and support units. Of the 15,847 personnel in a standard airmobile division, 938 are rated aviators. With more than four times as many aircraft as other divisions have, the airmobile division is capable of lifting itself into action and is better adapted for fighting in jungle, mountain, or other wild terrain than the more heavily-equipped divisions (although it, of course, lacks the firepower of the latter.) An airmobile division has 1,600 ground vehicles, about half as many as an infantry division, and has no tanks. Its artillery is light, consisting of three battalions of towed 105 mm. howitzers plus a battalion of 39 armed "Huey" helicopters serving as aerial artillery, and a company equipped with lighter helicopters for observation and fire adjustment. In short, everything about an airmobile division—vehicles, weapons, equipment, organization, and training—is built around helicopter airmobility.

The airmobile division should not be confused with the *airborne* division. For the sake of deployment by means of such tactical Air Force airlift planes as the C–123 Provider and the C–130 Hercules, the airborne division is also streamlined and specially trained and equipped. It has more than the average complement of airborne infantry or paratroopers, but it has no more than the normal amount of divisional Army aviation.

Army Aircraft

In fixed-wing aircraft, the Army has small transport planes for command and administrative use and very small airplanes for command-and-control, communications, and observation purposes. (The latter are in the process of being replaced by light two- and three-place helicopters.) The Army, however, has one fixed-wing aircraft that is rather advanced. This is the OV–1 Mohawk, a 300-mph twin turboprop two-seat STOL observation plane. Different versions are equipped for photography, radar, and infrared detection. Some are defensively armed, but they are not designed to provide aerial artillery firepower.

The basic workhorse of the Army helicopter fleet is the UH–1 Iroquois, nicknamed the "Huey." As airlifter it can carry up to two tons of payload or 11 passengers plus a crew of two. It is also used for aerial artillery with varying machine-gun and rocket-package armaments, and for observation and reconnaissance, aeromedical evacuation, and communications. The Army is developing a faster armed helicopter called the Cobra to replace the "Huey" as aerial artillery.

Heavier helicopters provide airlift of troops and equipment. The twin-rotor CH–47 Chinook (Fig. 47) can carry five to eight tons of payload (depending on mission). A new addition to the Army helicopter fleet is its heaviest lifter, the CH–54A Flying Crane, which can lift a ten-ton payload either in the form of a detachable van or a sling load; but it lacks the range and speed of the more versatile Chinook.

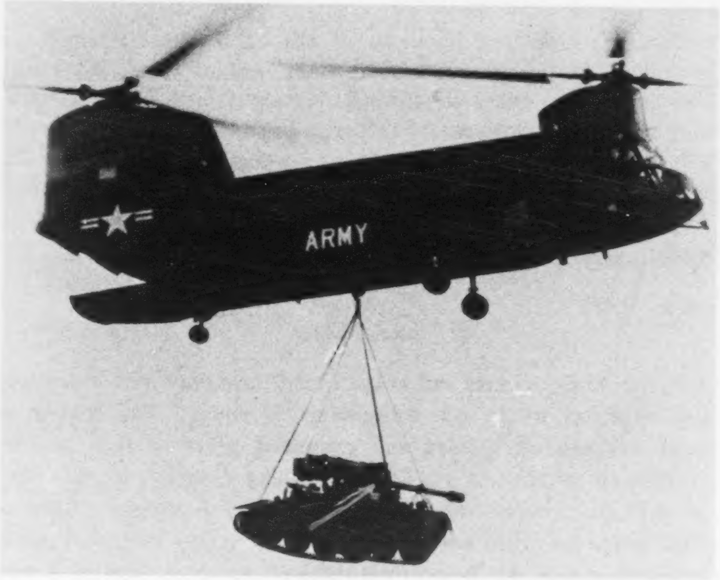

Figure 47. The CH–47 Chinook medium cargo helicopter.

To sum up the pros and cons of helicopters as compared with fixed-wing aircraft, let us consider the negative side first. Helicopters are slow, seldom exceeding 150 mph; the heaviest of them cannot compare in payload with such tactical fixed-wing transports as the C–123 Provider or the C–130 Hercules; large or small, their range is also limited, generally exceeding 200 miles only at the cost of reduced payload. Nor are they economical, since they are comparatively high in initial and maintenance costs and fuel consumption—whatever the size and payload. On the positive side, however, (and heavily outweighing these disadvantages in the Army's opinion) are the helicopter's ability to get into and out of places no fixed-wing aircraft can touch; and its extreme maneuverability in the air—the ability to fly forward, backward, or hover stationary. Even in the matter of vulnerability to enemy fire, there are pros and cons. While a slow-flying helicopter may seem more of a "sitting duck" than a swift airplane, its abilities to take evasive maneuvers, hover close to the ground, escape radar or visual detection by hiding behind hills or treetops, and pop up in unexpected places, give it a fighting chance which the crew of a fixed-wing aircraft might envy in some situations.

The Army's interest in future aircraft development is mainly in retaining these talents while overcoming lack of speed and range. This could mean either an improved helicopter or a V/STOL fixed-wing aircraft. Experimental helicopters have reached speeds of over 250 mph by means of a propeller or jet engine independent of the rotor drive (compound helicopter) or a jet-tipped rotor. Meanwhile various jet or turboprop V/STOL aircraft have made experimental flights under tri-service auspices.

Army Missiles

In the Army, rockets and missiles take their place beside cannons and howitzers to provide tremendous firepower. The heavier of these weapons are classed and organized either as field artillery (surface-to-surface) or air defense artillery (surface-to-air). Here we shall describe only the largest missiles in each category. Some of these might be called aerospace weapons. At any rate, they invite comparison with Air Force surface-to-surface or surface-to-air missiles or other tactical nuclear capability.

The Army's longest ranged field artillery missile, with a maximum range of more than 400 miles, is the Pershing, a nuclear ballistic missile. The Pershing system is mobile on four heavy tracked vehicles, including the launcher. Another mobile nuclear surface-to-surface ballistic missile is the Sergeant, with a range of more than 75 miles. These weapons are under the direct control of, respectively, a field army or corps commander. Further down the scale, employed at either corps or division level, is a large rocket (aimed by aiming the launcher like a gun but unguided in flight), the Honest John, which can be either nuclear or high-explosive armed, and has a range of about 25 miles. The Army also has an eight inch howitzer capable of firing a nuclear projectile.

Army air defense missiles, as previously mentioned, are part of the strategic defense system under NORAD. These include the Nike Hercules, which has a range of more than 75 miles and a ceiling of 100,000 feet, and can have either a conventional or a nuclear warhead; and the Hawk, shorter ranged and with a conventional warhead, especially designed for defense against low-flying aircraft (see again Figure 19).

The Hercules and Hawk, along with smaller air defense artillery weapons, are employed in overseas theaters as well as continental defense. In the field, air defense artillery is independently organized up to brigade level and is not assigned to divisions or corps as such but to installations and areas needful of air defense whether near the front or far to the rear. If in such position, air defense artillery is capable of providing surface-to-surface fire, it can be called upon to do so, but it is not deployed for that purpose.

UNITED STATES NAVY

As were the other services, the Navy was reorganized by the National Security Act of 1947. The Department of the Navy came under the direct control of the Department of Defense.

The Navy's stated objectives are to be prepared for all military missions as directed by the President or the Secretary of Defense. More specifically, in time of war, its primary missions are to seek out and destroy enemy forces at sea, destroy enemy sea commerce, gain and hold control of the sea, and conduct such operations as are necessary to meet these ends, including the use of air power.

The Navy has the unique ability to project sea power in the appropriate degree, manner, and time to assure control of the seas.

As we have stated, Navy nuclear-propelled submarines armed with Polaris (and eventually Poseidon) missiles constitute an increasingly important part of the Nation's strategic offensive forces; Navy components on a smaller scale are part of the NORAD strategic defensive system; and the Navy's main forces (like the Army's) can be classed as general purpose forces.

Navy aviation is a major component of modern sea power, as well as a significant part of the total scheme of military air power. The mission of naval aviation is to gain and maintain command of the air in support of fleet operations.

Regardless of its strategic or tactical possibilities, the naval air force is definitely an operating part of the fleet, as in the same sense as the submarine, destroyer, amphibious forces, or cruisers. The fleet air arm does not function as an autonomous or separate fighting force. No discussion of naval aviation is complete without looking at the aircraft carrier.

Aircraft Carrier

The aircraft carrier, an at-sea air base, is vital to the overall concept of naval operations. This self-supporting air base, shown in Figure 48, is a principal offensive instrument of naval sea power. It is necessary that we spend some time investigating the role of the aircraft carrier in naval aviation.

One of the most significant aspects of an aircraft carrier is its ability to have its concentrated airpower at potential trouble spots or to deploy readily to the scene of conflict. Also, amphibious landings and withdrawals can be covered and supported by aircraft from a nearby carrier if there is no local air base.

Perhaps we can better understand the role of the aircraft carrier, if we look at the geographical area of employment. Since 70 percent of the earth's surface is water, the aircraft carrier has a large degree of mobility. Because of this great freedom of movement, aircraft launched from carriers can influence about 90 percent of the inhabited areas of the world.

Two important aspects of a carrier's flexibility are: (1) air strikes can be made more rapidly and frequently over a shorter range, and (2) air strikes can be made from unpredictable directions.

Figure 48. USS Enterprise.

These advantages are provided without the necessity of building new airfields. A disadvantage is that the carrier offers a vulnerable target to any enemy ship, submarine, or aircraft that can penetrate its defenses, but the defenses are formidable. They include both the carrier's on-board weapons and detection devices and those of the destroyers and other escorting vessels—both close by and far ranging—that make up the total attack carrier strike force. All services have acknowledged the accomplishments of carrier-based aircraft in the Southeast Asia conflict.

Today, as in the future, the aircraft carrier is the core of naval striking power. Deployed within various fleets in the form of carrier task forces, they are accompanied by missile-armed cruisers, frigates, and destroyers. There are no substitutes for the attack carrier in providing flexible and controlled power in limited war situations.

The attack carrier also has the alternate capability of contributing to general war, should such a situation be created. Attack aircraft are capable of carrying high-yield nuclear bombs and missiles which can be used up to 1,500 miles from their carrier bases.

Aside from accomplishing the primary mission of gaining and keeping control of the air in support of fleet operations, the naval air arm can also aid the Air Force in certain operations. Naval air can provide advanced intelligence information, photo reconnaissance, early warning radar, fighter cover, search and destruction of submarines, and destruction of enemy forces.

All in all, the Navy has a potent air arm that can operate anywhere in the world. Primarily limited to aircraft carrier operations, naval aviation is concerned with the control of air in regard to sea operations. Highly successful in this area, the Navy is proud of its record and is striving to improve upon it.

Naval Aircraft

Because of space limitations aboard ship, aircraft assigned to carriers are of special design. Carrier aircraft must have folding wings to conserve space. Also, reinforced landing gear and fuselage are needed to absorb the shock of catapulted launchings and arrested landings. Since landing, parking, and takeoff areas are restricted in size, carrier operations are difficult to perform. Skilled pilots and crews are necessary to eliminate accidents and to make takeoff and landing operations as smooth as possible.

Nevertheless, the Navy answer to the limited landing and takeoff space problem is not, like the Army, to go in primarily for helicopters and STOL airplanes. The Navy has helicopters and various STOL aircraft, and has the same interest as the other services in the development of VTOL aircraft, but its aviation includes a full range of aircraft up to heavy transports, large search and warning aircraft, and jet-powered fighter and attack planes, some of these supersonic, but modified for carrier operation.

Certain of the Navy jets deserve mention here. The Navy has a carrier-operating version of the F–4 Phantom, with performance capabilities similar to those of the Air Force version—a mach 2.5 speed and a heavy armament payload that makes this aircraft the current first-line fighter of both services. Another supersonic Navy fighter is the F–8 Crusader, which can reach a speed of nearly mach 2. The F–14A and B, a variable-sweep wing version of the Air Force F–15, is being developed by the Navy to replace the now-cancelled F–111. Subsonic Navy jet attack aircraft include the A–7 Corsair and the A–4 Skyhawk. The A–6A Intruder is another jet attack aircraft, with an almost sonic top speed of mach 0.95. It is noteworthy for its highly sophisticated electronic gear to make it especially effective at night and in bad weather.

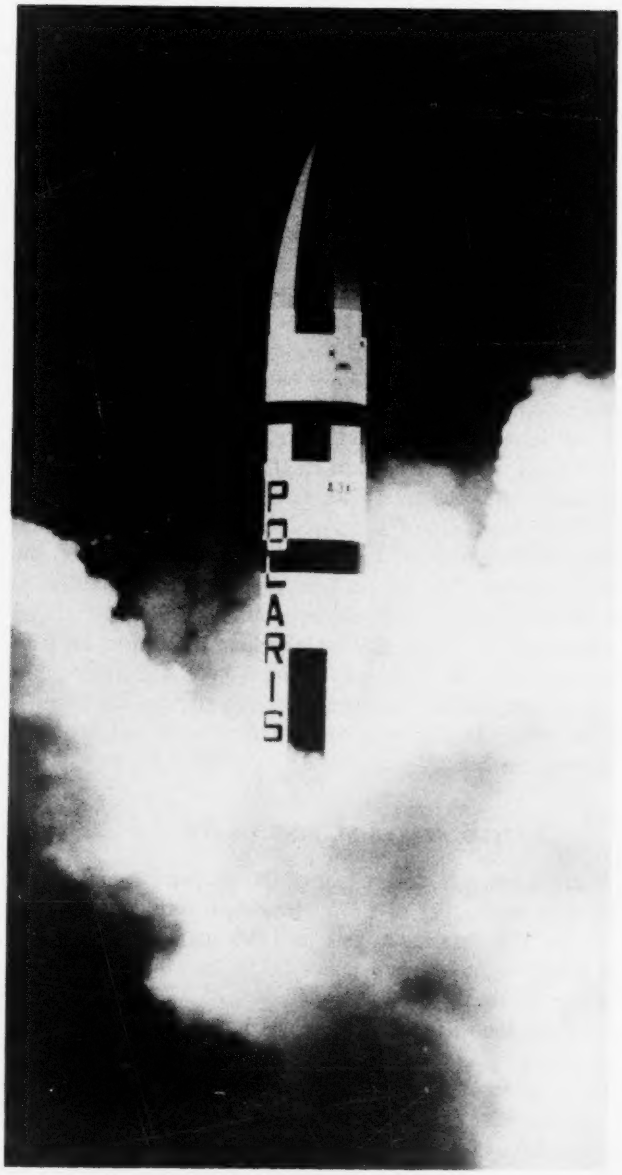

Figure 49. Polaris missile.

The Polaris and Other Navy Missiles

The Navy's contribution to the Nation's strategic offensive forces is its FBM (Fleet Ballistic Missile) submarine force. This consists of some 40 large (5,900 to 7,000 ton) submarines. These are nuclear-propelled and thus capable of staying underwater for months at a time. Each FBM submarine is armed with 16 Polaris missiles, different models of which have ranges from 1,500 to almost 2,500 miles and can thus penetrate to the heart of any continent from worldwide concealed undersea locations. The Polaris (Fig. 49) is inertially guided by a preset mechanism, according to precise knowledge of the locations of the submarine and its target. It is launched deep underwater; an air or gas/steam system propels it to the surface and the rocket motor ignites as the missile emerges into the air. A more advanced missile to replace the Polaris, the Poseidon, is under development. Even though the Poseidon is larger in diameter than the Polaris, it will be able to fit the launching tubes of the present submarines after the tubes are modified.

The Navy FBM force is not organized under a single command but is divided between the Atlantic and Pacific fleets. Like the forces of SAC, however, the submarines are directly responsive to Joint Chiefs of Staff and Presidential command.

Larger missiles of Navy surface vessels include the Asroc, an antisubmarine rocket; and the Terrier and the Talos, which are antiaircraft missiles comparable in range, respectively, to the Army's Hawk and Hercules. Terrier and Talos can also be employed as surface-to-surface missiles.

UNITED STATES MARINE CORPS

The Continental Marines, forerunner of the present Marine Corps, was established in November of 1775. Congress authorized the organization of the U.S. Marine Corps in 1798 and since that time the Marines have fought in every major battle in which the United States has been involved.

The primary mission of the Marine Corps is to provide Fleet Marine Forces, including air components, for seizing and defending advanced naval bases and conducting operations essential to naval campaigns. In addition, the Corps develops, along with the Air Force, Army, and Navy, the tactics, techniques, and equipment used by landing forces in amphibious actions. While not a part of the

Navy, but a separate military service within the Department of the Navy, the Marine Corps provides a powerful source of military strength always prepared to carry out national objectives anywhere in the world.

Marine Corps aviation has the primary function of providing air support to the Fleet Marine Forces in the execution of amphibious operations. This air support is accomplished by using ship-based or shore-based aircraft. A secondary function is to provide replacement squadrons to the aircraft carriers of the fleet.

Supplemental Marine air support is provided during the first stages of amphibious operations by aircraft from Navy carriers. Once prepared airfields are operational, Marines continue their operations from these land bases. These replacement squadrons are often called upon to perform tasks normally given to Navy squadrons. For this reason, all Marine squadrons are assigned carrier type aircraft and Marine pilots must be able to operate from the pitching decks of aircraft carriers.

SUMMARY

The total military aerospace power of the Nation is not wielded by the Air Force. Important segments of military aviation as well as nuclear missile firepower belong to the Army, Navy, and Marines. Furthermore, as brought out in the first chapter of this text and repeated in other chapters, the effectiveness of any one military service in combat depends upon close teamwork with other services. This can extend downward to joint task force organizations on a small scale, and especially to coordination of aviation effort.

As reaffirmed by an Army-Air Force agreement reached in 1966, Army aviation emphasizes the use of helicopters for combat mobility, aerial artillery firepower, and numerous observation, reconnaissance, command-and-control, and general utility uses. The nature of Army aviation employment depends to a great extent upon the way different types of Army divisions are organized. Most Army divisions have about 100 aircraft, but the new type of division known as airmobile has more than 400 with which to lift itself into combat, deliver supporting fire from the air, and perform other aviation functions. This type of division is especially adapted for fighting in rugged terrain. Army artillery firepower becomes aerospace striking power with the use of its 400-mile range Pershing and smaller nuclear missiles.

Aviation is of utmost importance in Navy operations. The aircraft carrier long ago replaced the battleship as the principal naval strike weapon, and Navy fleet and task forces are organized around carriers to provide support and defense of them. Despite the limited space of carrier decks, the Navy adapts first-line supersonic fighters like the F–4 Phantom and the F–8 Crusader to carrier operations.

Supplementing SAC in providing the Nation with strategic offensive power are the Polaris-armed nuclear-propelled submarines of the Fleet Ballistic Missile (FBM) fleet. The Polaris missiles are to be replaced with a newer and larger type called Poseidon.

Marine aviation is especially developed to support amphibious operations. Flyers are trained for either land-based or carrier operations.

REVIEW QUESTIONS

1. **Describe the mission of Army aviation.**
2. **What are the main differences between an airmobile and an airborne division?**
3. **Discuss the relative merits of helicopters and fixed-wing aircraft in tactical uses.**
4. **Explain the role of the aircraft carrier in naval operations.**
5. **What strategic offensive forces are provided by the Navy?**
6. **Explain the Marine Corps role in aerospace forces.**

THINGS TO DO

1. As a research project, trace the history of the Navy's Fleet Ballistic Missile forces, giving particular attention to the work of Admiral Rickover in developing nuclear-powered submarines and the work of Admiral Raborn in developing the Polaris missile.
2. Watch for news of new developments in high-speed helicopters or V/STOL aircraft. *Aviation Week* and *Air Force and Space Digest* are good sources for this information.

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